Nevada
Environmental
Restoration
Project

DOE/NV--1218

National Nuclear Security Administration

Post-Closure Inspection and Monitoring Report for Corrective Action Unit 110: Area 3 WMD U-3ax/bl Crater, Nevada Test Site, Nevada

For the Period July 2006 - June 2007

Controlled Copy No.:_____

Revision: 0

July 2007

Environmental Restoration
Project

U.S. Department of Energy
National Nuclear Security Administration
Nevada Site Office

DISCLAIMER

DOE/NV--1218

POST-CLOSURE INSPECTION AND MONITORING REPORT FOR CORRECTIVE ACTION UNIT 110: AREA 3 WMD U-3ax/bl CRATER, NEVADA TEST SITE, NEVADA

FOR THE PERIOD JULY 2006 - JUNE 2007

U.S. Department of Energy
National Nuclear Security Administration
Nevada Site Office
Las Vegas, Nevada

Controlled Copy No.____
Revision: 0
July 2007

THIS PAGE INTENTIONALLY LEFT BLANK

POST-CLOSURE INSPECTION AND MONITORING REPORT FOR CORRECTIVE ACTION UNIT 110: AREA 3 WMD U-3ax/bl CRATER, NEVADA TEST SITE, NEVADA

FOR THE PERIOD JULY 2006 - JUNE 2007

Approved By: Original signed by: P Sanders for Date: 07/24/2007
Sabine T. Curtis
Acting Federal Sub-Project Director
Industrial Sites Sub-Project

Approved By: Original signed by: K Cabble Date: 07/24/07
Kevin J. Cabble
Acting Federal Project Director
Environmental Restoration Project

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

FIGURES

TABLES

APPENDICES

ACRONYMS AND ABBREVIATIONS

BJY	Buster Jangle Y
CAU	Corrective Action Unit
cm	centimeter(s)
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
DOE/NV	U.S. Department of Energy, Nevada Operations Office
EPA	U.S. Environmental Protection Agency
FFACO	*Federal Facility Agreement and Consent Order*
ft	foot (feet)
in.	inch(es)
m	meter(s)
LLNL	Lawrence Livermore National Laboratory
NDEP	Nevada Division of Environmental Protection
NNSA/NV	U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NTS	Nevada Test Site
PCIMR	Post-Closure Inspection and Monitoring Report
RCRA	*Resource Conservation and Recovery Act*
RWMS	Radioactive Waste Management Site
SM	subsidence monument
TDR	Time Domain Reflectometry
UR	use restriction
VMC	Volumetric Moisture Content
WMD	Waste Management Division

THIS PAGE INTENTIONALLY LEFT BLANK

EXECUTIVE SUMMARY

This Post-Closure Inspection and Monitoring Report (PCIMR) provides the results of inspections and monitoring for Corrective Action Unit (CAU) 110, Area 3 WMD [Waste Management Division] U-3ax/bl Crater. This PCIMR includes an analysis and summary of the site inspections, repairs and maintenance, meteorological information, and soil moisture monitoring data obtained at CAU 110, for the annual period July 2006 through June 2007.

Site inspections of the cover were performed quarterly to identify any significant changes to the site requiring action. The overall condition of the cover, perimeter fence, and use restriction (UR) warning signs was good. However, the condition of cover vegetation was observed to have deteriorated significantly compared to the previous reporting period. Additionally, settling was observed that exceeded the action level as specified in Section VII.B.7 of the Hazardous Waste Permit Number NEV HW021 (Nevada Division of Environmental Protection, 2005). This permit states that cracks or settling greater than 15 centimeters (6 inches) deep that extend 1.0 meter (m) (3 feet [ft]) or more on the cover will be evaluated and repaired within 90 days of detection.

Along the east edge of the cover (repaired previously in August 2003, December 2003, May 2004, October 2004, and February 2006), an area of settling was observed during the September 2006 inspection that would imminently exceed the action level and require repair. This area of settling on the cover was repaired in December 2006. Additional cracking was observed along the north edge of the cover during the March 2007 inspection that exceeded the action level, which was repaired in May 2007. Significant animal burrows were also observed during the March 2007 inspection, which were investigated by National Security Technologies, LLC, ecological services, and small mammal trappings were performed in May 2007.

The semiannual subsidence surveys were performed in September 2006 and March 2007. No significant subsidence was observed in the survey data. Monument 5 shows the greatest amount of subsidence (-0.021 m [-0.07 ft] compared to the baseline survey of 2000). This amount is negligible and near the resolution of the survey instruments; it does not indicate that subsidence is occurring overall on the cover.

Soil moisture results obtained to date indicate that the CAU 110 cover is performing well but may be suffering from inhibited evapotranspiration due to poor vegetation over two of the monitoring stations. Time Domain Reflectometry (TDR) data from two of the monitoring stations indicated a sustained increase in soil moisture (1 to 3 percent volumetric moisture content [VMC] change) at a depth of 1.8 m (6 ft) since the exceptionally heavy precipitation from the January and February 2005 precipitation events. The moisture profile in these probe nests above and below this depth, as well as at the remaining two monitoring stations, returned to baseline conditions by October 2005. At 2.4 m (8 ft) below the cover surface, TDR data show soil moisture content remained between 10 and 13 percent VMC.

Considering the heavy precipitation experienced during previous reporting periods followed by below-average drought conditions, a compliance level will be established when the system reaches a steady state and equilibrium has been established.

THIS PAGE INTENTIONALLY LEFT BLANK

1.0 INTRODUCTION

1.1 SCOPE AND OBJECTIVES

Corrective Action Unit (CAU) 110, Area 3 WMD [Waste Management Division] U-3ax/bl Crater, is located in Area 3 of the Nevada Test Site (NTS) in Nye County, Nevada. This Post-Closure Inspection and Monitoring Report (PCIMR) provides an analysis and summary of site inspections, repair and maintenance activities, subsidence surveys, vegetation monitoring, meteorological information, and soil moisture monitoring data obtained at CAU 110 for the period July 2006 through June 2007. This PCIMR has been prepared in accordance with the *Federal Facility Agreement and Consent Order* (FFACO) of 1996.

Inspections of CAU 110 are conducted quarterly to determine and document the physical condition of the Area 3 WMD U-3ax/bl Crater cover and any unusual conditions that could impact the proper operation of the waste unit cover.

The objective of the soil moisture monitoring program is to monitor the stability of soil moisture conditions within the upper 2.4 meters (m) (8 feet [ft]) of the cover and detect changes that may indicate moisture movement exceeding the designed performance expectations of the cover.

1.2 BACKGROUND

The Area 3 WMD U-3ax/bl Crater is an historic radioactive disposal unit located within the Area 3 Radioactive Waste Management Site (RWMS) on the NTS (Figure 1). The unit, which was formed by excavating the area between two subsidence craters (U-3ax and U-3bl), was operationally closed in 1987 under the *Resource Conservation and Recovery Act* (RCRA) as a hazardous waste landfill.

The Area 3 WMD U-3ax/bl Crater was identified as an historic RCRA site and was closed in accordance with the RCRA Part B Permit issued by the Nevada Division of Environmental Protection (NDEP), Permit Number NEV HW009 (NDEP, 2000). This permit specified that the unit would be closed under Title 40 Code of Federal Regulations (CFR) Part 265 (U.S. Environmental Protection Agency [EPA], 1996) closure requirements for interim status facilities. Additional closure requirements included U.S. Department of Energy (DOE) Order 5820.2A (DOE, 1988) and DOE Order 435.1 (DOE, 1999).

1.3 GEOLOGIC SETTING

Area 3 is located in Yucca Flats, a topographically closed valley on the eastern side of the NTS (Lawrence Livermore National Laboratories [LLNL], 1982). Yucca Flats is an internal draining, north-south trending valley and is bounded on the north by Quartzite Ridge; on the east by Halfpint Range; on the south by Yucca Lake, Mine Mountain, CP Hills, and Massachusetts Mountain; and on the west by Rainier Mesa, Eleana Range, and Shoshone Mountain.

Surficial sediments in Area 3 consist of Quaternary and Tertiary valley-fill alluvium derived from the surrounding mountains, which are composed of Paleozoic carbonates and clastics and tertiary volcanics. These Quaternary/Tertiary alluvial strata occur within fault-bounded troughs above the underlying Tertiary volcanic section. The average thickness of this alluvium material

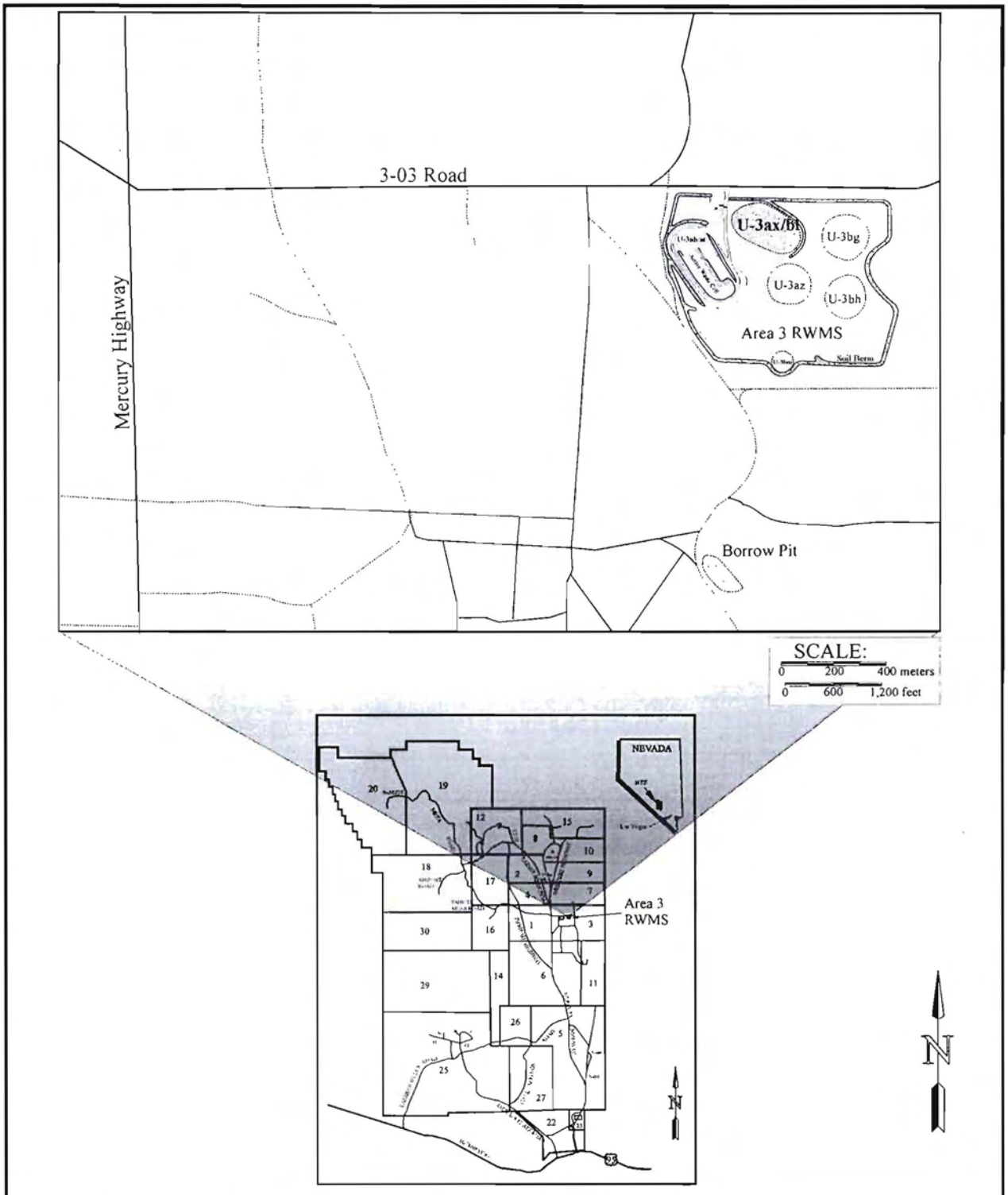


FIGURE 1
LOCATION OF CAU 110: AREA 3 WMD U-3AX/BL CRATER

is approximately 300 m (980 ft), although in some places it is as thick as 2,000 m (6,560 ft). The alluvium is made up of gravel and poorly sorted sands with intermittent silt beds (LLNL, 1982).

The Yucca Flats watershed is a structurally closed basin encompassing an area of approximately 780 square kilometers (300 square miles). The structural geomorphology of Yucca Flats is typical of the Basin and Range Physiographic Province and lies in one of the most arid regions of the country. Located in the Ash Meadow Groundwater Basin, groundwater generally flows southwest and discharges at the large springs in Ash Meadows, about 25 miles southwest of Mercury, Nevada (Winograd and Thordarson, 1975). Water balance calculations for Area 3 indicate that it is continuously in a state of moisture deficit.

THIS PAGE INTENTIONALLY LEFT BLANK

2.0 POST-CLOSURE MONITORING REQUIREMENTS

2.1 BACKGROUND

Post-closure monitoring requirements for CAU 110 are described in the Closure Report for CAU 110 (U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office [NNSA/NV], 2001).

2.2 SITE INSPECTIONS

Inspections are performed quarterly, and consist of visual observations to inspect the condition of the cover and to document the status of use restriction (UR) warning signs and site fencing. Each site inspection is documented on a site inspection form, and copies of these are included in Appendix A of this report.

The post-closure inspection consists of the following:

- The perimeter of the cover fencing is walked by the inspector, and the condition of the fencing, UR warning signs, entrance gate, and lock is documented.
- The seven survey subsidence monuments (SMs) located on the cover are inspected. In addition, the elevations of all seven SMs are surveyed twice a year and compared to baseline elevations collected in 2000 to determine if the cover has subsided.
- During each inspection, any changes in the condition of the cover, warning signs, or fenced area are documented. Specific changes noted on the current condition of the cover include, but are not limited to, trash/debris within the fenced compound, animal burrows/nesting activity, or erosion of the cover.
- Cracks or areas of settling less than 15 centimeters (cm) (6 inches [in.]) deep on the cover are documented and scheduled for repair on an annual basis. Larger cracks or areas of settling are immediately evaluated and repaired within 90 days.
- All repair work must preserve the original cover "as built" design. If the cover repair requires modification of the cover design, the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office (NNSA/NSO) will present a formal design modification request to NDEP prior to making the design modification.

2.3 SOIL MOISTURE MONITORING

The CAU 110 cover is designed to limit infiltration of precipitation into the disposal unit through evapotranspiration by vegetation on the cover. The cover performance is monitored using Time Domain Reflectometry (TDR) soil water content sensors that are buried at 0.3-m (1-ft) depth intervals up to 2.4 m (8 ft) within the waste cover to provide water content profile data. TDR probes are installed at a distance of 50.3 m (165 ft) from the southern edge of the cover. An array of eight probes (a stack) is repeated at four locations across the cover (Figures 2 and 3). The soil water content profile data are used to determine whether the cover is functioning as designed. Soil moisture content data from the TDR moisture probes are recorded daily and stored on a datalogger. The data are downloaded remotely over a radio/telephone link.

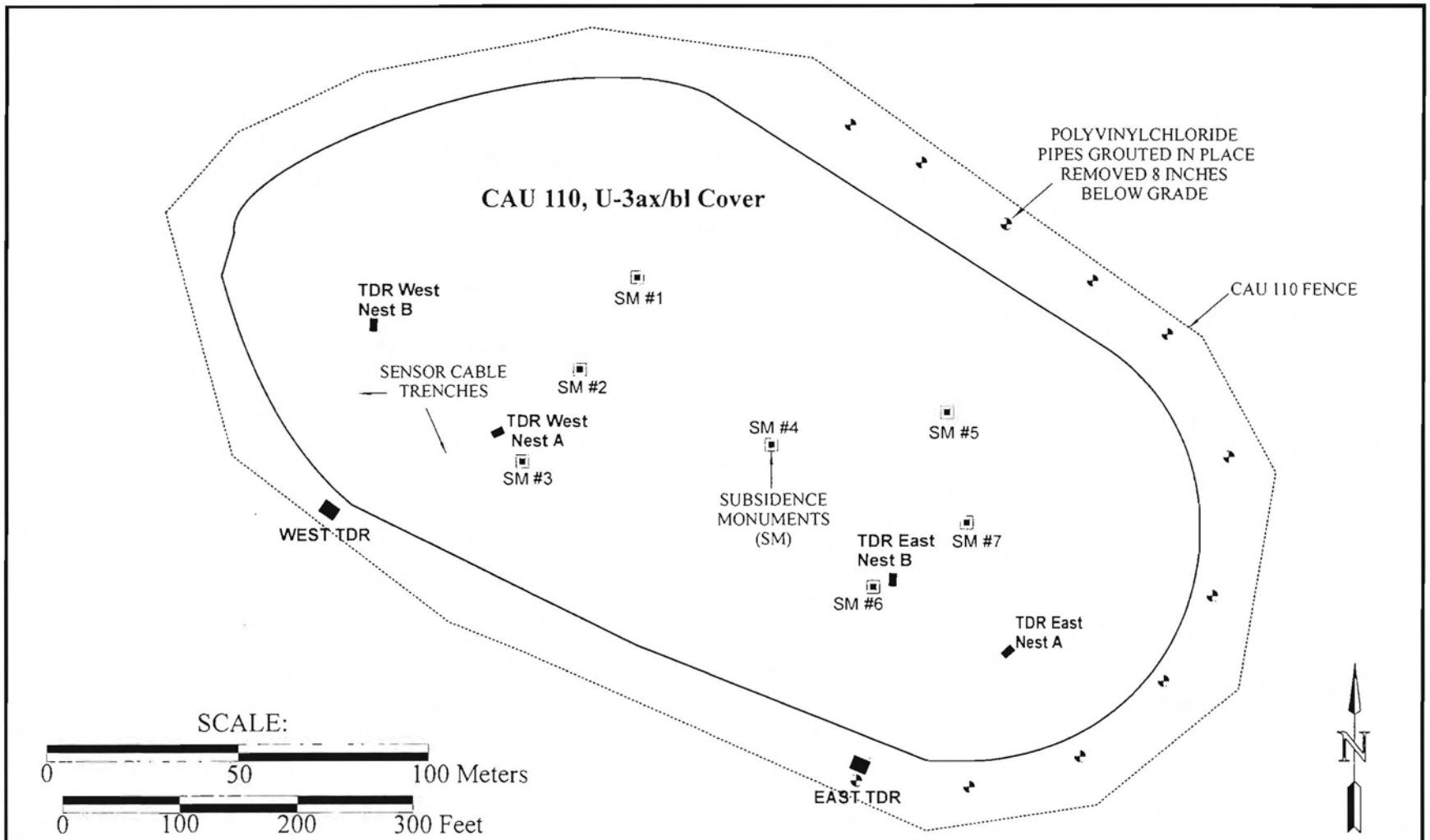


FIGURE 2
PLAN VIEW OF CAU 110, AREA 3 WMD U-3AX/BL CRATER, COVER TIME DOMAIN REFLECTOMETRY NEST AND TRENCH LOCATIONS

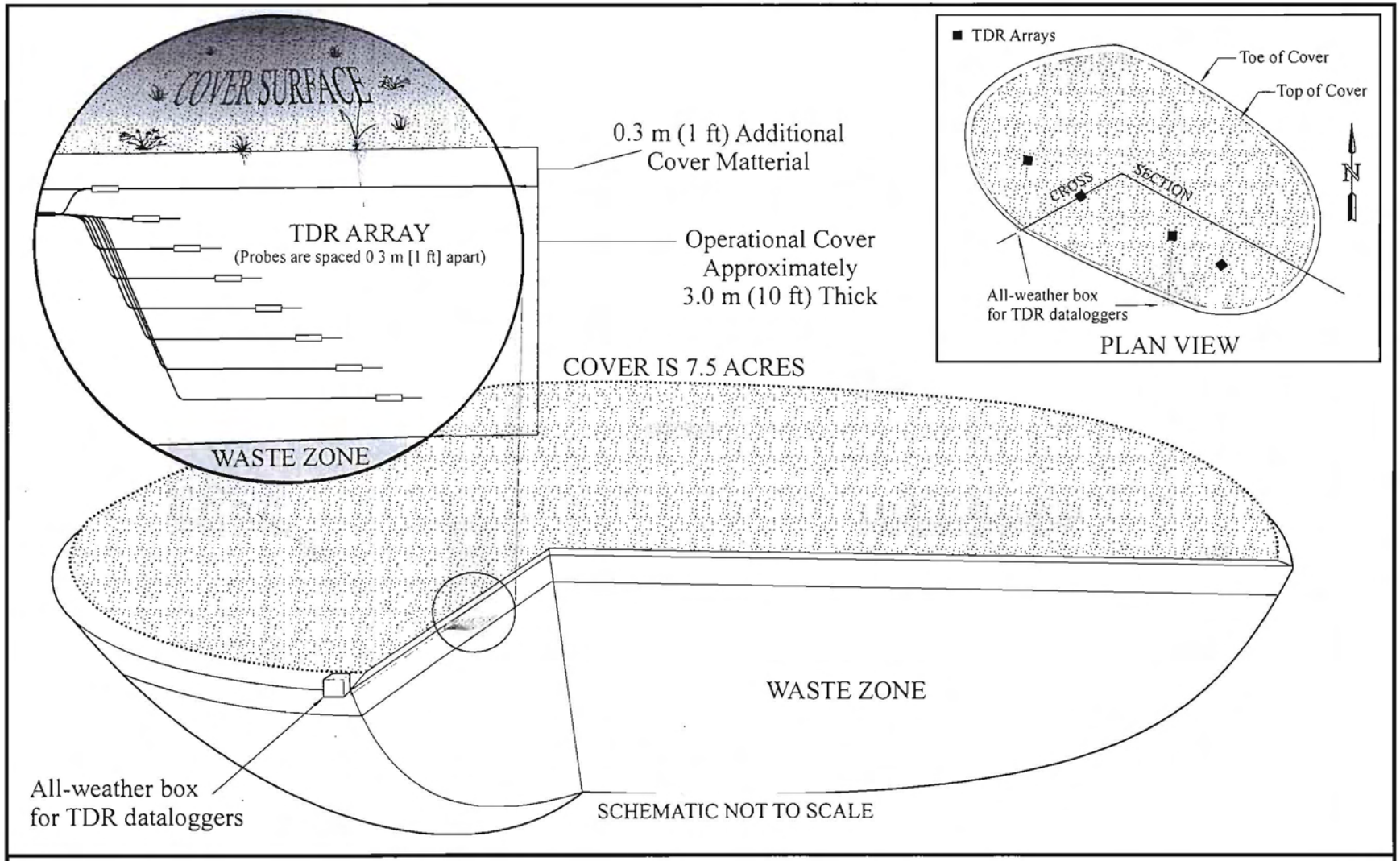


FIGURE 3
TIME DOMAIN REFLECTOMETRY INSTALLATION DIAGRAM

2.4 COMPLIANCE CRITERIA

The CAU 110 cover boundary is defined by the fence installed around the cover, which is approximately 3.0 hectares (7.5 acres) in area. The point of compliance is at the deepest TDR soil moisture probe (2.4 m [8 ft] below the cover surface). Compliance will be set based on soil moisture content; however, the specific criteria will not be established until enough data have been collected during average site conditions to establish a realistic compliance level. Once the soil moisture content within the cover reaches equilibrium under normal precipitation conditions, soil moisture compliance values will be agreed upon with NDEP. During this monitoring period, the response of the cover during normalization from above-average rainfall during the 2004 and 2005 reporting periods followed by under-average precipitation conditions in 2006 and the present reporting period was observed and compared to predicted performance. Once the cover reaches equilibrium, which it is expected to approach during the next reporting period should precipitation conditions normalize, a compliance level can be established.

The following compliance criteria have been established:

1. Notify NDEP of noncompliance within 14 days of determining that the cover is not operating according to the established compliance criteria.
2. Compile a list of non-critical maintenance activities (cracks or settling imperfections equal to or less than 15 cm [6 in.] deep on the cover), and address them in the following fiscal year.
3. Evaluate and repair cracks or settling features greater than 15 cm (6 in.) deep that extend 1 m (3 ft) or more on the cover within 60 days of detection.

2.5 REPORTING REQUIREMENTS

All inspection and maintenance activities conducted during the year will be documented and submitted to NDEP. The annual PCIMR will be provided on or before August 31 of each year. The proposed duration of post-closure inspections is five years. After five years of post-closure inspections and monitoring, NNSA/NSO may submit a request to NDEP to reevaluate the monitoring program and/or schedule.

The annual PCIMR will include the following information:

- Brief summary of each inspection
- Inspection checklists, field notes, and site photographs
- Subsidence survey results
- Monthly precipitation records for the Buster Jangle Y (BJY) meteorological station
- Periodic reports on the health of cover vegetation
- Soil moisture content profiles for the reported monitoring period
- Maintenance and repair documentation (if any)
- Specific recommendations for nonstandard maintenance or changes in post-closure monitoring

3.0 SITE INSPECTIONS, SURVEYS, AND MAINTENANCE

3.1 SITE INSPECTION RESULTS

Site inspections are conducted in March, June, September, and December. The inspections are completed to evaluate and document the performance and maintenance needs of CAU 110 in accordance with the requirements of Title 40 CFR Part 265.15, the RCRA Part B Permit (NDEP, 2005), and the CAU 110 Closure Report (NNSA/NV, 2001).

Site inspection documentation includes copies of the inspection checklists, field notes, and site photographs. Copies of the inspection checklists, associated field notes, and site photographs for September 2006, December 2006, March 2007, and June 2007 are included in Appendix A.

3.1.1 September 19, 2006, Inspection

- Minor settling and cracks were observed around the previously repaired areas, which were predicted to imminently exceed the settling compliance criterion.
- The condition of UR warning signs, fencing, TDR stations, SMs, and cover vegetation was good.

Conclusions/Recommendations:

- Perform cover repairs.
- Continue inspections as scheduled.

3.1.2 December 20, 2006, Inspection

- The previously repaired areas were in good condition with no indication of cracking or settling.
- Small animal burrows were observed along the northwest edge of the cover.
- The condition of UR warning signs, fencing, TDR stations, SMs, and cover vegetation was good.

Conclusions/Recommendations:

- Continue inspections as scheduled.

3.1.3 March 29, 2007, Inspection

- Settling imperfections were discovered that exceeded the compliance criterion, which extended 3 to 4 ft on the northeast edge of the cover.
- Extensive animal burrowing was noted across the area of the cover.
- The condition of UR warning signs, fencing, TDR stations, SMs, and cover vegetation was good.

Conclusions/Recommendations:

- Perform cover repairs.
- Perform small mammal trapping and relocation.

- Continue inspections as scheduled.

3.1.4 June 4, 2007, Inspection

- Previously repaired subsidence areas were in good condition.
- No significant cracks or subsidence was noted on the cover.
- A few ground squirrels were noted; however, most burrows appear to be unoccupied, including one inactive ant colony.
- The condition of UR warning signs, fencing, TDR stations, SMs, and cover vegetation was good.

Conclusions/Recommendations:

- Continue inspections as scheduled.

3.2 SUBSIDENCE SURVEY

Seven SMs were installed on the cover to provide elevation control and to determine if subsidence of the cover occurs. The SM location map is provided in Appendix C. The initial baseline subsidence survey was conducted on December 14, 2000. Subsequent surveys are conducted twice a year and are compared to the December 2000 baseline survey results. During this monitoring period, the subsidence surveys were done on September 19, 2006, and March 15, 2007.

The subsidence survey results are tabulated in Table 1. No significant subsidence is observed in the survey data. Monument 5 shows the greatest decrease in elevation (-0.021 m [-0.07 ft]) compared to the baseline survey in 2000. Calculated subsidence values are negligible and near the resolution of the survey instruments, and do not indicate that subsidence is occurring on the cover.

3.3 VEGETATION SURVEY

The CAU 110 cover was initially planted with native seed on December 4 - 5, 2000. Revegetation surveys have been conducted every spring since the site was seeded, to assess the success of the seeding effort. The May 2007 vegetation survey report and methodology are included in Appendix D. The status of the vegetation on the CAU 110 cover was evaluated by estimating the amount of vegetative cover and density of plant species.

3.3.1 Vegetated Cover

Plant Cover

The area covered by vegetation was 9 percent lower this year than it was last year. The diversity of perennial plant cover decreased significantly on the closure cover, and perennial plants made up 100 percent of the total vegetative cover in 2007. No living cover was present on the unseeded areas between the fence and the closure cover, consistent with the previous year. The average percent cover estimates over the last five years are presented in Table 2.

TABLE 1. AREA 3 WMD U-3AX/BL CRATER SUBSIDENCE MONUMENT ELEVATIONS AND SUBSIDENCE RESULTS

DATE	Elevation at Top of Monument[1] Subsidence (ft)						
	SM #1	SM #2	SM #3	SM #4	SM #5	SM #6	SM #7
December 2000 Baseline	4,021.84	4,021.28	4,019.83	4,020.99	4,021.87	4,019.25	4,020.52
	-	-	-	-	-	-	-
July 2001	4,021.83	4,021.28	4,019.83	4,020.98	4,021.86	4,019.24	4,020.51
	-0.01	0.00	0.00	-0.01	-0.01	-0.01	-0.01
January 2002	4,021.84	4,021.28	4,019.83	4,020.98	4,021.86	4,019.24	4,020.51
	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01
September 2002	4,021.83	4,021.27	4,019.83	4,020.98	4,021.86	4,019.24	4,020.50
	-0.01	-0.01	0.00	-0.01	-0.01	-0.01	-0.02
January 2003	4,021.83	4,021.27	4,019.83	4,020.98	4,021.86	4,019.24	4,020.50
	-0.01	-0.01	0.00	-0.01	-0.01	-0.01	-0.02
July 2003	4,021.83	4,021.27	4,019.83	4,020.97	4,021.85	4,019.24	4,020.50
	-0.01	-0.01	0.00	-0.02	-0.02	-0.01	-0.02
March 2004	4,021.82	4,021.26	4,019.82	4,020.97	4,021.83	4,019.22	4,020.49
	-0.02	-0.02	-0.01	-0.02	-0.04	-0.03	-0.03
September 2004	4,021.82	4,021.26	4,019.82	4,020.96	4,021.83	4,019.23	4,020.49
	-0.02	-0.02	-0.01	-0.03	-0.04	-0.02	-0.03
March 2005	4,021.82	4,021.26	4,019.82	4,020.96	4,021.82	4,019.22	4,020.49
	-0.02	-0.02	-0.01	-0.03	-0.05	-0.03	-0.03
September 2005	4,021.82	4,021.26	4,019.82	4,020.97	4,021.82	4,019.23	4,020.49
	-0.02	-0.02	-0.01	-0.02	-0.05	-0.02	-0.03
March 2006	4,021.82	4,021.26	4,019.82	4,020.96	4,021.82	4,019.23	4,020.49
	-0.02	-0.02	-0.01	-0.03	-0.05	-0.02	-0.03
September 2006	4,021.82	4,021.25	4,019.82	4,020.96	4,021.81	4,019.22	4,020.49
	-0.02	-0.03	-0.01	-0.03	-0.06	-0.03	-0.03
March 2007	4,021.82	4,021.25	4,019.82	4,020.96	4,021.80	4,019.22	4,020.48
	-0.02	-0.03	-0.01	-0.03	-0.07	-0.03	-0.04

[1] Elevations based on North American Vertical Datum of 1929 in ft.

Plant Density

In 2007, the annual density of plant coverage was the lowest to date, with 2.0 plants per square meter. The perennial plant density for 2007 is the lowest it has been in the last five years. The amount of vegetative cover experienced during this reporting period is less than would be expected on native, undisturbed vegetation. Despite the increase in plant size reported during the previous reporting period, the cover experienced a significant falloff both in the number of plant species as well as the plant density. The most historically dominant plant species, shadescale, remained as the only persistent vegetation on the cover during the current reporting period. Those species reduced to zero or a near-zero population on the cover are Russian thistle, Nevada ephedra, winterfat, and both perennial and annual grasses, including Indian ricegrass. The heavy precipitation events in 2005 and early 2006 temporarily increased the biomass across the cover, causing a dramatic increase in the small mammal population during the 2006 calendar year, which due to current drought conditions have grazed much of the biomass, increasing plant mortality.

TABLE 2. CAU 110 AVERAGE PERCENT COVER ESTIMATES

	2002	2003	2004	2005	2006	2007
Total Vegetative Cover	6.4 %	3.2 %	12.8 %	20.2 %	19.6 %	10.6 %
Perennial Cover	6.4 %	2.4 %	9.6 %	16.8 %	19.6 %	10.6 %
Annual Cover	0.0 %	0.8 %	3.2 %	3.4 %	0.0 %	0.0 %
Mulch/Litter	24.1 %	28.0 %	14.6 %	26.2 %	23.2 %	25.8 %
Bare	Not Recorded	30.4 %	38.4 %	5.4 %	57.2 %	63.6 %
Alluvium / Gravel	Not Recorded	38.4 %	34.2 %	48.2 %		

3.3.2 Conclusions and Recommendations

Total plant cover decreased from 19.6 percent in 2006 to 10.6 percent in 2007. This is an indication that native plant species on the cover have successfully survived the drought conditions that followed reseeding in 2000 and have returned to equilibrium after the increased precipitation of the previous year. The 9 percent decrease in plant cover this year is attributed to the current drought conditions and the subsequent actions of small grazing mammals.

Based on revegetation efforts in similar regions, a goal of 12 percent plant cover after 5 years was established. This does not represent the final plant cover expected on the cover, but an intermediate stage. The 5-year goal was met and exceeded the two previous reporting periods, but has declined below the 12 percent goal during the current reporting period. Actual total plant cover is 10.6 percent; all of it is attributed to perennial native plants. Eventually, should precipitation normalize to historical levels, the plant cover should approach 25 percent, based on the results of cover estimates for similar plant communities on NTS.

The perennial planets found on the cover are well established and continue to provide a viable vegetative cover. While the decrease in plant density appears to indicate added stress on the plants from the robust populations of small mammals during the current reporting period, there is no indication that remedial vegetation is necessary. Vegetation monitoring in future years should focus on the effects of the increased number of small mammals and lagomorphs during the last two reporting periods, specifically on the density and vigor of the perennial plants present on the closure cover. Without a cover of perennial native plants, these areas are prone to invasion by annual weedy species, which can spread to adjacent areas. Should these invasive species increase in density on the closure cover and appear to have a detrimental effect on the perennial plant species, as evidenced by decreases in perennial plant cover and/or density, some remedial action may be necessary to protect the composition and stability of the vegetative cover. The CAU 110 cover vegetation should continue to be monitored annually to evaluate plant cover, density, and diversity.

3.4 MAINTENANCE AND REPAIR

Site maintenance and cover repairs were made in December 2006 and May 2007 as a result of observations made during site inspections.

3.4.1 December 12 - 13, 2006, Repairs

During the September 19, 2006, inspection, one area of settling on the southeast portion of the cover exceeded the settling compliance criterion. The area along the east side of the cover had been repaired on several previous occasions. The area was repaired over the period of December 12 - 13, 2006. A portable, gas-powered tamper was used to compact the cracks in the cover. The area was backfilled with clean, native soil using wheelbarrows and shovels, and then compacted using the tamper. Field notes for this repair are included in Appendix A.

3.4.2 April 30 - May 3, 2007, Mammal Trapping

Because of the large number of small animal burrows found on the cover and fence line during the March 29, 2007, site inspection, trapping and relocating small mammals on the cover was undertaken. This activity began the week of April 30, 2007, during which a total of 46 animals were trapped and relocated from the cover, including whitetail antelope squirrels and kangaroo rats.

3.4.3 May 10 - 14, 2007, Repairs

During the March 29, 2007, site inspection, an area of settling on the northeast edge of the cover exceeded the settling compliance criterion. The area along the east side of the cover had been repaired on several previous occasions. The area was repaired over the period of May 10 - 14, 2007. A portable, gas-powered tamper was used to compact the cracks in the cover. The area was backfilled with clean, native soil using wheelbarrows and shovels, and then compacted using the tamper. Field notes for this repair are included in Appendix A.

THIS PAGE INTENTIONALLY LEFT BLANK

4.0 SOIL MOISTURE MONITORING

The CAU 110 cover is designed to limit infiltration into the disposal unit through evapotranspiration from vegetation established on the cover for that purpose. The cover performance is monitored using TDR to provide a profile of the water content within the cover. The soil water content data will establish whether the cover is performing as designed and is in compliance with the closure plan and any compliance criteria established in the future. The point of compliance is the depth of the deepest TDR soil moisture probe (2.4 m [8 ft]).

Compliance will be based on soil moisture content; however, the area was under drought conditions since monitoring began in 2001 and continued through 2003. The drought conditions were followed by two years of exceptionally high rainfall (26.49 cm [10.43 in.] and 23.32 cm [9.18 in.]) which produced measurable infiltration events. After drought conditions again in 2006, the current reporting period indicates continued drought conditions (16.41 cm [6.46 in.]), which will allow the cover to continue to equilibrate to steady-state conditions, at which time the soil moisture content trigger values will be set.

The soil moisture content is obtained using two Campbell Scientific TDR-100 dataloggers housed in instrumentation shelters located along the periphery of the cover (Figure 2). TDR probes are Campbell Scientific CS610s using RG8 coaxial cable. The probes are installed at a distance of 50.3 m (165 ft) from the edge of the cover, and buried in the cover at depths of 0.3 to 2.4 m (1 to 8 ft) below the cover surface, one probe every 0.3 m (1 ft). Arrays of eight probes (a nest) are positioned at four locations across the cover (Figure 3). Soil moisture content data from the TDR moisture probes are collected once per day and stored on a datalogger. A radio link connects both the eastern and western TDR dataloggers to a telephone line at the Area 3 RWMS office, and the data are downloaded over this remote link.

Calibration of the TDR probes was documented in Appendix I of the CAU 110 Closure Report (NNSA/NV, 2001). The TDR probes were calibrated with a "dry-down" method using native soils and the full cable length. The results of the calibration indicated that a site-specific calibration equation should be used, instead of the standard Topp equation. It was also noted that due to the long cable lengths and high soil conductivities, the TDR reflection end points were extremely flat under saturated and near-saturated conditions, resulting in unreliable data in these regions. Therefore, the TDR calibration was fit only up to 30 percent Volumetric Moisture Content (VMC).

A linear regression of the calibration data over the range of 5- to 30-percent VMC yielded the following calibration equation:

$$\% \text{ VMC} = 10.3737 \times (\text{L/L}) - 17.137$$

where L/L is the trace length/probe length as recorded by the datalogger.

4.1 PRECIPITATION DATA

Precipitation data were collected from the Air Resources Laboratory, Special Operations and Resources Division's CLINET Station BJY, located at 37° 03' 46" N, 116° 03' 09" W, in Area 3 of the NTS, approximately 4.8 kilometers (3 miles) northwest of CAU 110. Precipitation records obtained from this station are used to report the official rainfall for CAU 110. Precipitation records for this station for the period July 2006 through June 2007 are found in Appendix E. The precipitation data are presented in Figure 4.

The total precipitation recorded for the current monitoring period from July 2006 through June 2007 was 4.41 cm (1.74 in.). The average annual precipitation over the period 1960 through 2005 at the BJY Station is 16.41 cm (6.46 in.). Yearly rainfall has begun to normalize, with 23.32 cm (9.18 in.) recorded in the 2005 calendar year and 23.32 cm (9.18 in.) in the 2006 calendar year. Rainfall for the period January 2007 through June 2007 is 1.71 cm (0.68 in.), with a historic average over the same period of 1.5 cm. (0.59 in.), indicating that the system may be approaching normal conditions.

4.2 SOIL MOISTURE MONITORING RESULTS

4.2.1 Results

Graphs of the TDR-derived soil moisture content, combined with the daily precipitation from the BJY meteorological station, are presented in Figures 5 through 8. Data collection began on January 25, 2001, just prior to the start of supplemental irrigation.

The soil moisture graphs, Figures 5 through 8, show several responses: the initial conditions, the irrigation wetting event and infiltration, the trend to steady-state conditions, wetted conditions from the heavy precipitation that began in late 2004, and a second trend to steady-state conditions. The initial conditions at the beginning of the data collection reflect the disturbed soil's intrinsic moisture conditions. The installation of the TDR probes is described in detail in the CAU 110 Closure Report (NNSA/NV, 2001). Health and safety considerations required that hazards caused by dust be minimized during the TDR probe installation; the trenching and compaction of each of the soil lifts required some water to be added to the soils prior to handling. The amount of water added to the soil, while kept to a minimum, was variable and resulted in a vertical moisture content profile that was not necessarily monotonic with depth as would be expected with a natural profile. Consequently, some depths appear wetter than others and are expected to remain so until the system fully equilibrates.

4.2.2 Data Trends

Summer temperatures and germination of the seeds, along with the increase in evapotranspiration, have produced long-term trends, which can be seen in the data from about October 2001 to the present. An annual cycle of increasing soil moisture content at all depths can be observed peaking in August and decreasing to a minimum in January. This seasonal cyclic behavior lags behind the temperature and is most likely a combination of effects caused by the increased thermal gradient, water vapor transport from depth, and the lack of transpiration of plants during the hot summer months.

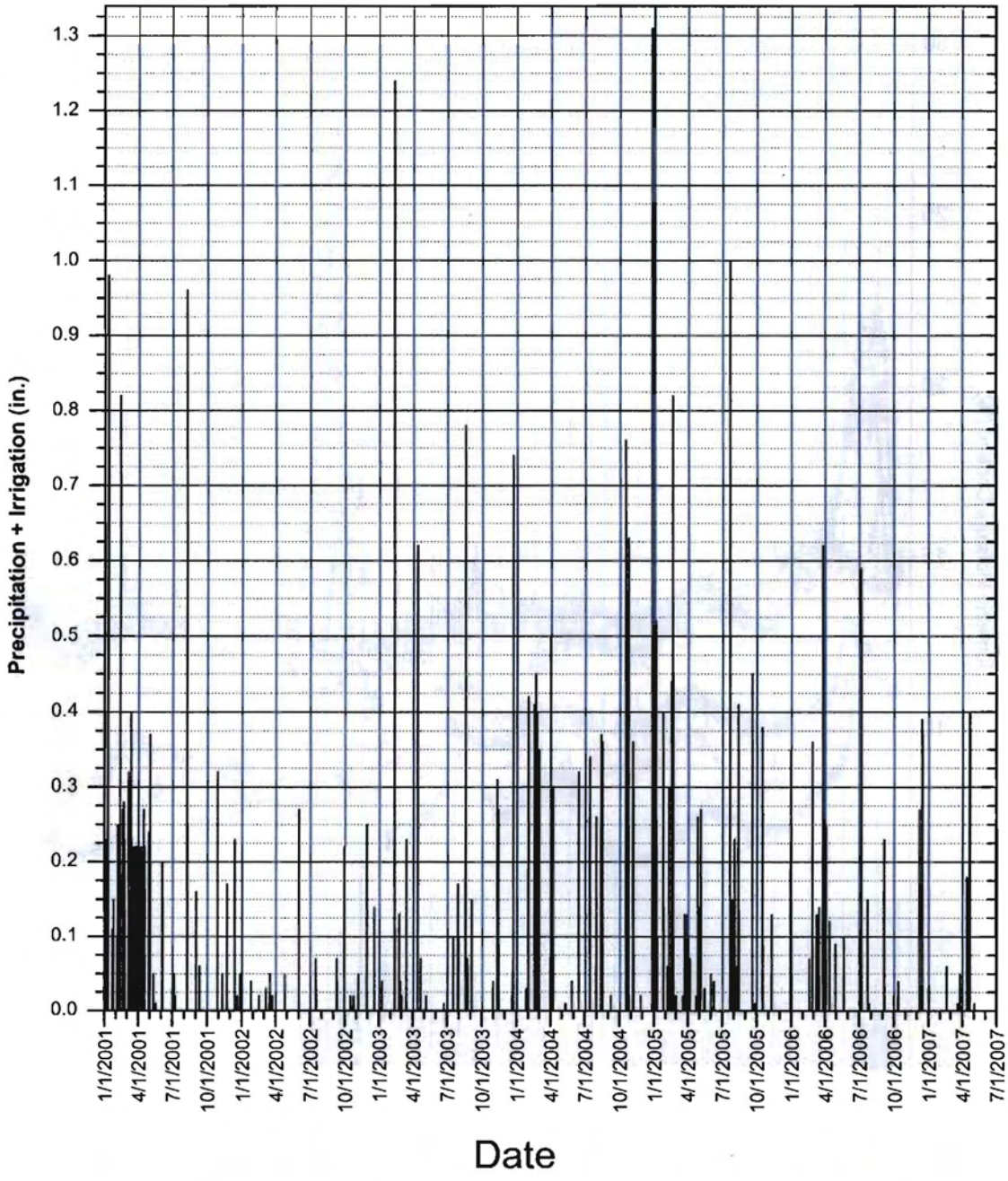


FIGURE 4
PRECIPITATION DATA FOR METEOROLOGICAL STATION BUSTER JANGLE Y

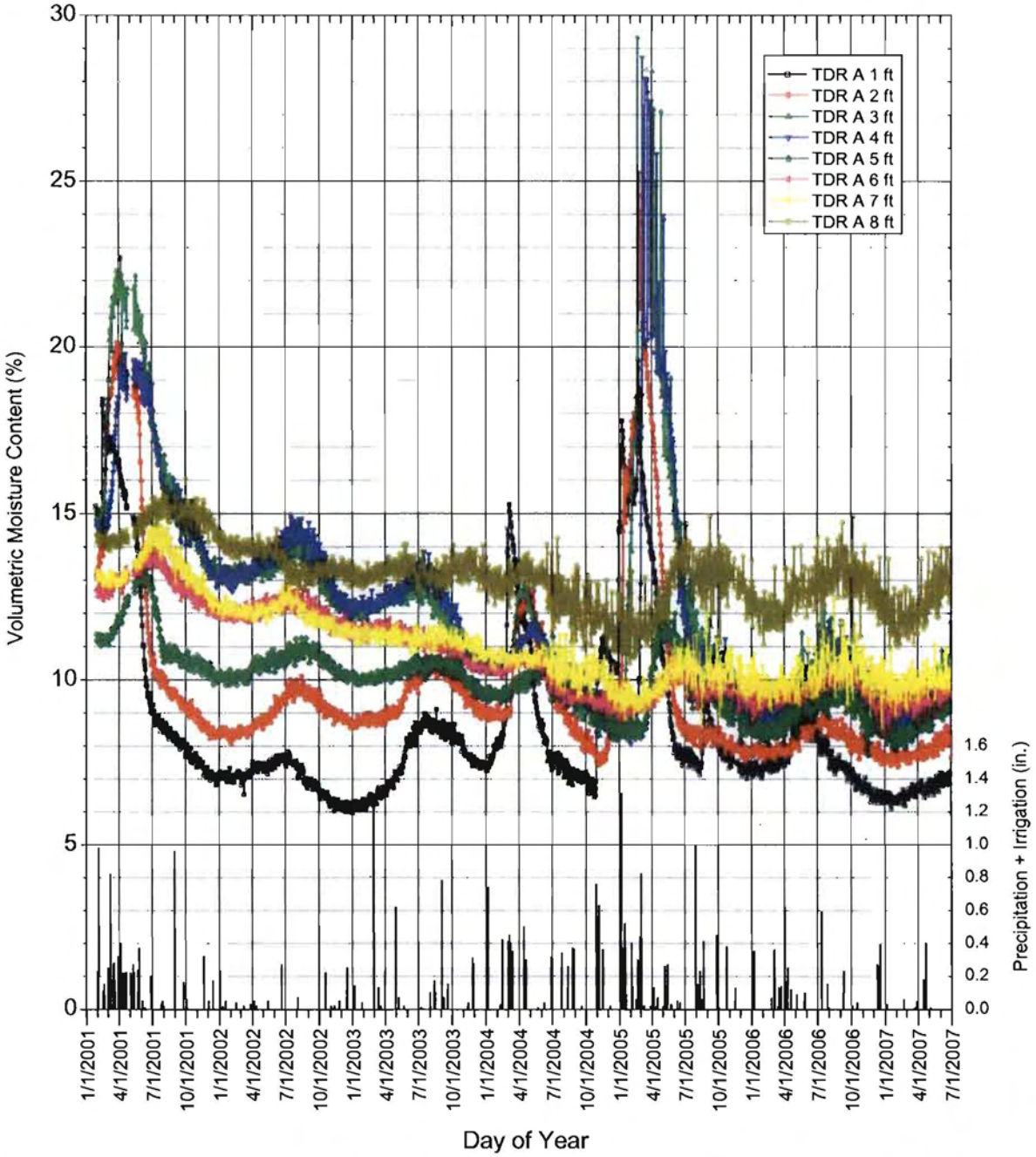


FIGURE 5
EAST TDR NEST A SOIL MOISTURE CONTENT

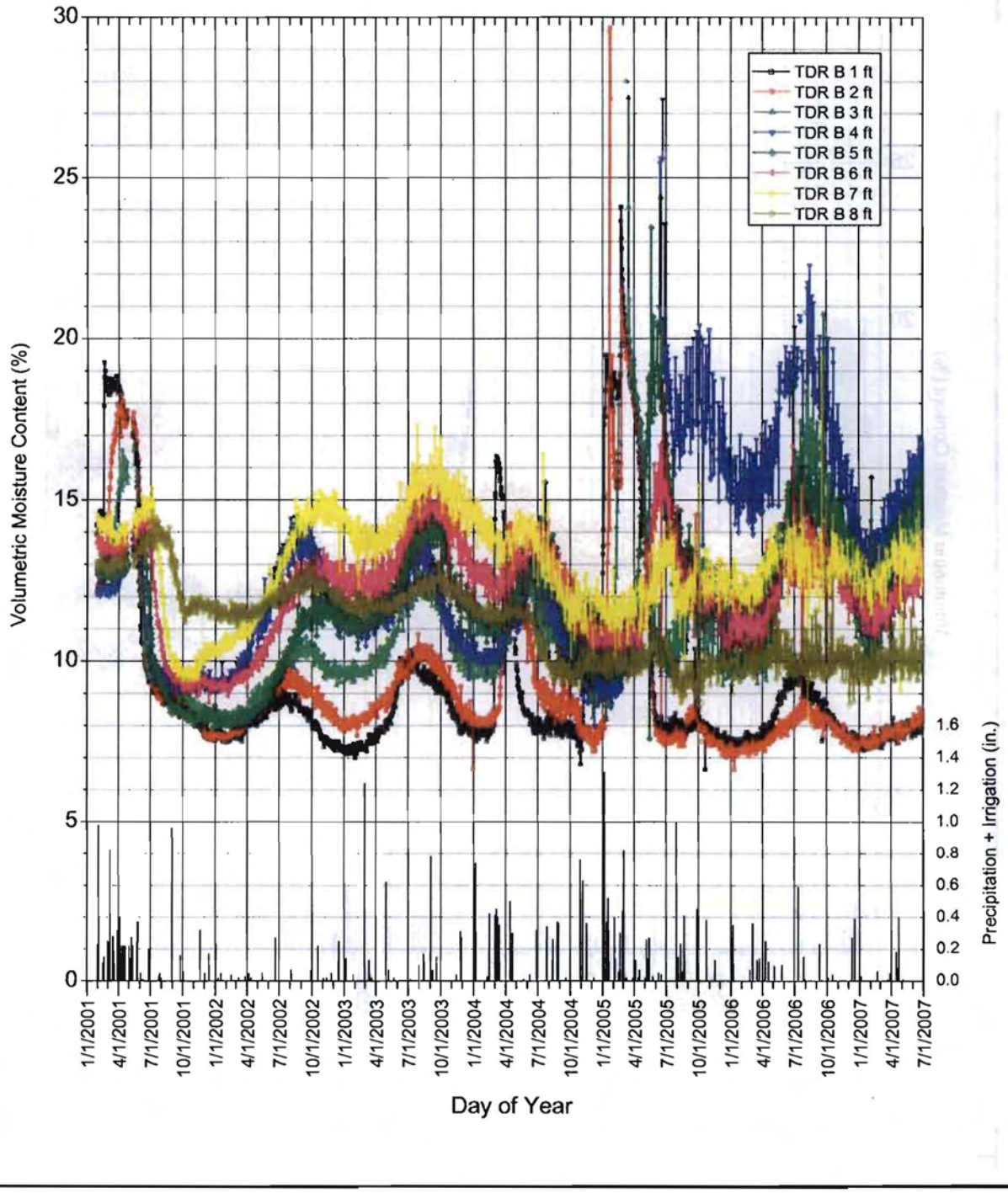


FIGURE 6
EAST TDR NEST B SOIL MOISTURE CONTENT

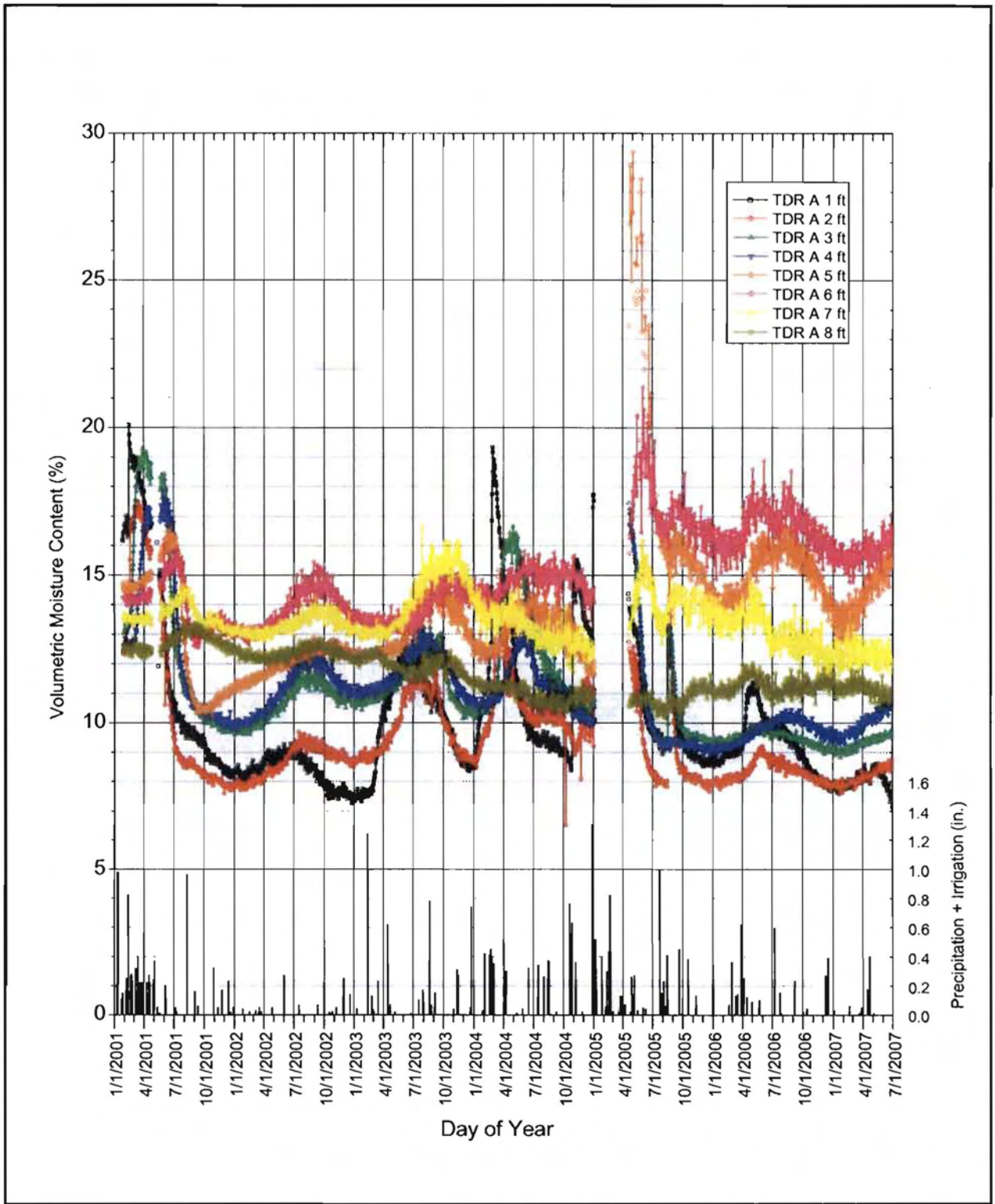


FIGURE 7
WEST TDR NEST A SOIL MOISTURE CONTENT

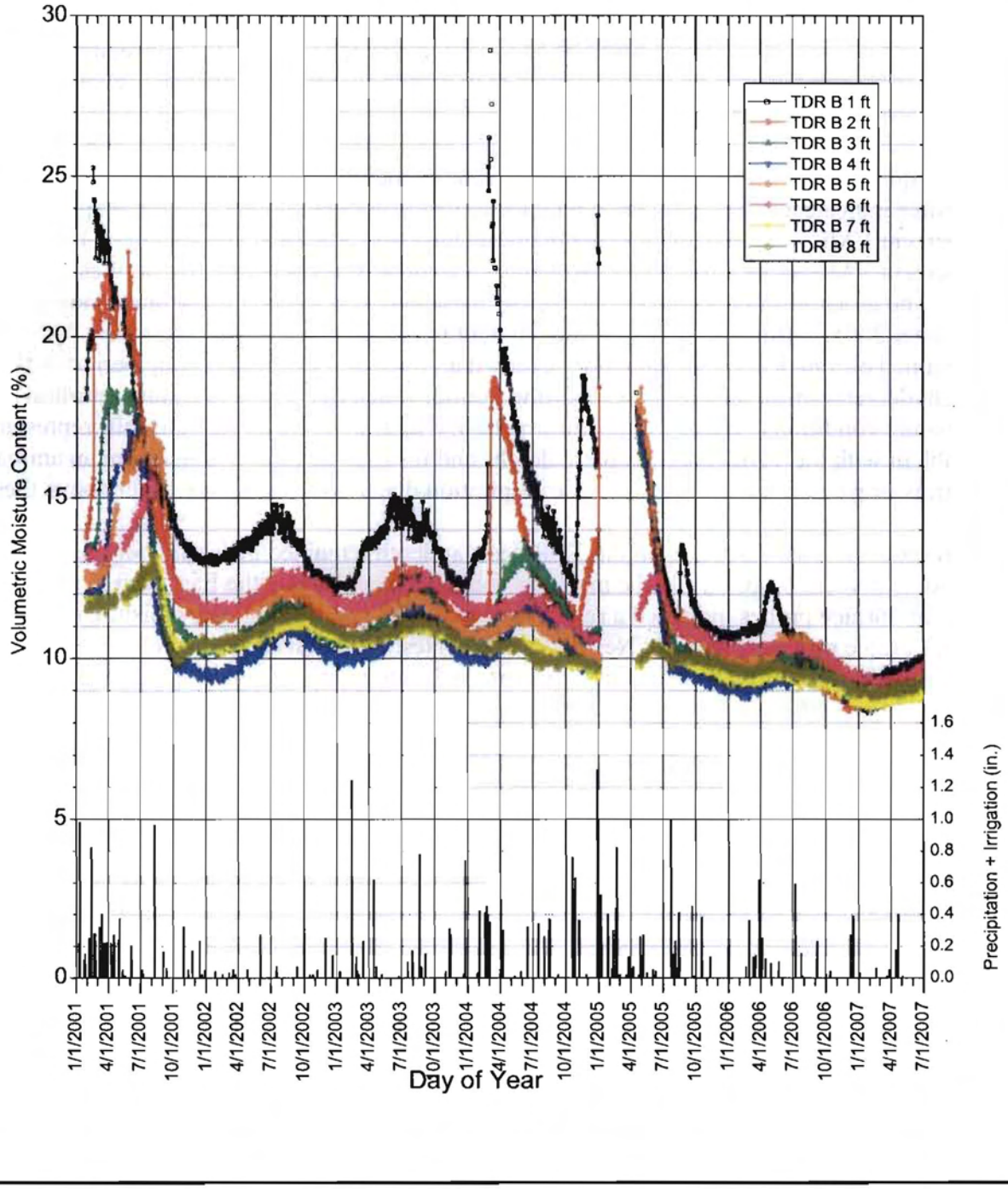


FIGURE 8
WEST TDR NEST B SOIL MOISTURE CONTENT

The TDR data indicate that the soil moisture content in the CAU 110 cover had been approaching steady-state under the prior drought conditions. The heavy precipitation in January and February 2005 (10.9 cm [4.3 in.]) created saturated surface conditions with some infiltration noted to approximately 1.8 m (6 ft) in both the east and west TDR nests. The moisture content profiles on both the East Nest A and West Nest B stations indicated an increase of approximately 1.5 percent VMC at 1.8 m (6 ft) depth, with drying to baseline conditions by October 2005. The subsequent nominal rainfall conditions experienced during 2006 and the consequent decrease in moisture content in both the east and west TDR nests may indicate that the system is returning to equilibrium conditions.

Subsequent to the saturation event in January 2005, the East Nest B and West Nest A moisture profiles indicate a sustained shift in retained moisture content, with a change of approximately 5 percent VMC at the 1.2 m (4 ft) depth on the East Nest B station and a similar shift of 2 and 3 percent VMC at the 1.5 m (5 ft) and 1.8 m (6 ft) depths, respectively, in the West Nest A data set. The moisture contents above and below these depths returned to baseline conditions by October 2005. While the total moisture content in the East Nest B and West Nest A stations has remained elevated since the saturation event, data from the current reporting period indicated a slight decrease from the previous reporting period, which may indicate a slow return to pre-2005 moisture conditions. Based on this information, it appears unlikely that the shift represents a problem with the TDR probes at these depths and instead suggests leakage from an animal burrow or poor root uptake and evapotranspiration due to low vegetative cover above these nests.

Soil moisture content values on the TDR nests at depth remained generally between 10 to 14 percent VMC, while the moisture content as reported by the East Nest A and West Nest B near-surface probes indicated a return to steady-state conditions. The moisture content on near-surface probes at the East Nest B and West Nest A stations remained elevated from heavy precipitation and infiltration events experienced during previous reporting periods, indicating the possibility of inhibited cover performance. Additional information will be necessary to determine whether or not the system is experiencing a sustained trend toward steady-state conditions.

5.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 SUMMARY

- Inspections of the CAU 110 cover were performed to identify any significant changes to the unit requiring action. Cracking and settling requiring action were observed at previous problematic areas in September 2006, repaired in December 2006, observed again in March 2007, and repaired in May 2007.
- Subsidence surveys in September 2006 and March 2007 indicated a maximum decrease in elevation at SM 5 of -0.021 m (-0.07 ft), which is near the limit of resolution of the survey instruments. No substantial overall cover subsidence was observed.
- Shallow soil moisture content decreased but remained elevated in two of the four moisture monitoring stations, indicating possibly inhibited cover performance due to poor evapotranspiration or infiltration due to animal burrowing.
- The plant community on the cover is well established. Plant cover is 9 percent lower this year than it was last year. Plant density is at the lowest point since the site was seeded, but all were perennial plant species; annual plants were not observed this year.
- Soil moisture contents for the TDR nests at depth are generally between 10 and 14 percent VMC. Increases in moisture content of up to three percent VMC extended to 1.8 m (6 ft) on some TDR nests, and then either began to decrease or recovered completely to baseline conditions by the end of June 2007.
- All posted UR warning signs and site fencing are in good repair.

5.2 CONCLUSIONS

- Significant subsidence to the cover has not occurred.
- Plant cover has decreased to 10.6 percent from 19.6 percent, which is below the plant cover density goal of 12 percent. While remedial revegetation is not necessary, future monitoring should focus on the effects of the increased populations of small mammals and lagomorphs.
- Soil moisture results obtained to date indicate that the CAU 110 cover is functioning as designed.

5.3 RECOMMENDATIONS

- Continue to monitor the vegetated cover annually to evaluate plant cover, density, and diversity.
- Continue to monitor the cover during scheduled inspections for further evidence of settling and the need for repair.
- Considering the heavy precipitation experienced during previous reporting periods, a compliance level will be established when the system reaches a steady state and equilibrium has been established.

THIS PAGE INTENTIONALLY LEFT BLANK

6.0 REFERENCES

DOE, see U.S. Department of Energy.

EPA, see U.S. Environmental Protection Agency.

FFACO, see *Federal Facility Agreement and Consent Order*.

Federal Facility Agreement and Consent Order. 1996 (as amended). Agreed to by the State of Nevada, the U.S. Department of Energy, and the U.S. Department of Defense.

LLNL, see Lawrence Livermore National Laboratory.

Lawrence Livermore National Laboratory. 1982. "The Geology of Yucca Flat." In *Energy and Technology Review*, April. Livermore, CA.

NDEP, see Nevada Division of Environmental Protection.

NNSA/NV, see U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office.

Nevada Division of Environmental Protection. 2000. *Permit For a Hazardous Waste Facility, Permit Number NEV HW009*; Section VII.B.7, Carson City, NV.

Nevada Division of Environmental Protection. 2005. *Permit For a Hazardous Waste Facility, Permit Number NEV HW021*; Section VII.B.7, Carson City, NV.

U.S. Department of Energy, Nevada Operations Office. 1988. "Radioactive Waste Management," DOE Order 5820.2A, U.S. Department of Energy. Washington, D.C.

U.S. Department of Energy, Nevada Operations Office. 1999. "Radioactive Waste Management," DOE Order 435.1, U.S. Department of Energy. Washington, D.C.

U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office (DOE/NV). 2001. *Closure Report for Corrective Action Unit 110: Area 3 RWMS U-3ax/bl Crater Disposal Unit, Nevada Test Site, Nevada*, DOE/NV--733, Revision 1. August 2001. Las Vegas, NV.

U.S. Environmental Protection Agency. 1996. Title 40 Code of Federal Regulations 265.90, Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities Ground Water Monitoring. Washington, D.C.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A

INSPECTION CHECKLISTS, FIELD NOTES, AND PHOTOGRAPHS

THIS PAGE INTENTIONALLY LEFT BLANK

CAU 110: AREA 3 WMD U-3ax/bl CRATER, POST-CLOSURE INSPECTION CHECKLIST

Inspection Date and Time: 9-19-06 9:45 AM	Reason for Inspection: Quarterly
Date of Last Post-Closure Inspection: 6-20-06	Reason for Last Post-Closure Inspection: Quarterly
Responsible Agency: Bechtel Nevada Environmental Restoration	
Address: Nevada Test Site, Mercury, Nevada	
Responsible Agency Official: Jeffrey L. Smith, Project Manager	

Chief Inspector: Shaughn Burnison	Title: Field Tech Lead	Organization: Environmental Restoration
Assistant Inspector: Mike Floyd	Title: Field Tech Lead	Organization: Environmental Restoration

A. GENERAL INSTRUCTIONS

1. All checklist items must be completed and detailed comments made to document the results of the site inspection. The completed checklist is part of the field record of the inspection. Additional pages should be used as necessary to ensure that a complete record is made. Attach the additional pages and number all pages upon completion of the inspection.
2. Any checklist line item marked by an inspector in a SHADED BOX must be fully explained or an appropriate reference to previous reports provided. The purpose of this requirement is to provide a written explanation of inspector observations and the inspector's rationale for conclusions and recommendations. Explanations are to be placed on additional attachments and cross-referenced appropriately. Explanations, in addition to narrative, will take the form of sketches, measurements, and annotated site maps.
3. The site inspection is a walking inspection of the entire site including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist.
4. A standard set of color photographs is required. In addition, all anomalous features or new features (such as changes in adjacent area land use) are to be photographed. A photograph log entry will be made for each photograph taken.
5. Field notes taken to assist in completion of this checklist will become part of the inspection record. No form is specified for field notes; however, they must be legible and in sufficient detail to enable review by succeeding inspectors and the responsible agency.
6. This unit will be inspected quarterly with formal reporting to the Nevada Division of Environmental Protection to be done annually. The annual report will include an executive summary, this inspection checklist with field notes and photograph log attached, and recommendations and conclusions.

B. PREPARATION (To be completed prior to site visit)	YES	NO	EXPLANATION
1. Has the Post-Closure Permit been reviewed?	X		
2. Have the design basis documents been reviewed?	X		
3. Have the site as-built plans and site base map been reviewed?	X		
4. Have the previous inspection reports been reviewed?	X		
a. Were anomalies or trends detected on previous inspections?		X	
b. Was maintenance performed?		X	
5. Have the site maintenance and repair records been reviewed?	X		
a. Has site repair resulted in a change from as-built conditions?		X	
b. Are revised as-built plans available that reflect repair changes?	X		

C. SITE INSPECTION PREPARATION

Assemble the following, as needed, to conduct inspections:

a. Camera, film, and batteries
b. Keys to locks
c. Clipboard
d. Tape measure
e. Radio, pager, etc.
f. Previous Post-Closure Report, Inspection Checklists, repair records, and as-built plans
g. Other miscellaneous support equipment

CAU 110: AREA 3 WMD U-3ax/bl CRATER, POST-CLOSURE INSPECTION CHECKLIST

D. SITE INSPECTION	YES	NO	EXPLANATION
1. Adjacent off-site features:			
a. Have there been any changes in the use of the adjacent area?		X	
b. Are there any new roads or trails?		X	
c. Has there been any change in the position of nearby washes?		X	
d. Has there been lateral excursion or erosion/deposition of nearby washes?		X	
e. Are there new drainage channels?		X	
f. Has there been a change in the surrounding vegetation?		X	
2. Access roads, fences, gates, and signs:			
a. Is there a break in the fence?		X	
b. Have any posts been damaged or their anchoring weakened?		X	
c. Does the gate show evidence of tampering or damage?		X	
d. Was the gate locked?	X		
e. Is there any evidence of human intrusion onto the cover?		X	
f. Is there any evidence of large animal intrusion onto the cover?		X	
g. Have any signs been damaged or removed? (Number of signs replaced: 0)		X	
h. Other?	X		some tumbleweeds outside on the fence. Should blow away naturally by wind
3. Monuments and other permanent features:			
a. Have survey markers, boundary monuments, or monitoring stations been disturbed?		X	
b. Do natural processes threaten the integrity of any survey marker, boundary monument or monitoring station?		X	
c. Is there excessive vegetation around the survey markers, boundary monuments, or monitoring stations?		X	
d. Other?		X	
4. Waste unit cover:			
a. Is there evidence of settling?	X		SE portion of cover has settling in same spot that was repaired already. Cracking is also evident in the settling area
b. Is there evidence of cracking?	X		
c. Is there evidence of erosion (wind or water)?		X	
d. Is there evidence of animal burrowing?		X	
e. Is there a change in the vegetation growing on the cover not consistent with the naturally-occurring vegetation growing outside the unit?		X	
g. Other (including trash, debris, etc within fenced area)?		X	

CAU 110: AREA 3 WMD U-3ax/bl CRATER, POST-CLOSURE INSPECTION CHECKLIST

5. Photograph Instructions.

A total of 8 photographs are required to be taken during each inspection of CAU 110. Additional photographs may also be taken. The required photographs shall be taken as follows:

- Four (4) from the center of the unit, one in each compass direction (i.e., N, S, E, W) and
- Four (4) of the unit from outside the fence, one in each compass direction.

6. Photograph Documentation:	YES	NO	EXPLANATION
a. Have all photographs required by the photograph instructions been taken?	X		
b. Has a photograph log been prepared? (Number of photographs taken: 11)	X		
c. Other?		X	

E. FIELD CONCLUSIONS

1. Is there an imminent hazard to the integrity of the unit? (Immediate report required)		X	
Person/Agency to whom report was made:			
2. Are more frequent inspections required?		X	
3. Are existing maintenance/repair actions satisfactory?		X	A SINGLE SETTLING FEATURE IS FAILING AGAIN...
4. Is other maintenance/repair necessary?	X		SETTLING AND SUBSIDENCE HAS PRODUCED CRACKS VERY NEARLY EXCEEDING COMPLIANCE CRITERIA

5. Field conclusions/recommendations: Signs and fencing is in good condition. One of the repairs previously done on SE portion is not holding well- subsidence was again identified. THIS IS A SINGLE CIRCULAR FEATURE WITH CRACKS WHICH WILL IMMINENTLY EXCEED 3' LENGTH AND DEPTH GREATER THAN 6". REPAIR IS RECOMMENDED

F. CERTIFICATION

I have conduction an inspection of CAU 110, Area 3 WMD U-3ax/bl Crater, in accordance with the procedures of the Post-Closure Permit (including the Post-Closure Plan) as recorded on this checklist, attached sheets, field notes, photographs, and photograph logs.

Chief Inspector's Signature:	Date: 9/19/2006
Printed Name: SHAUGHN A. BURNISON	Title: FIELD SUPPORT TECH LEAD

CAU 110: AREA 3 WMD U-3ax/bl CRATER, POST-CLOSURE INSPECTION CHECKLIST

Inspection Date and Time: 12/20/06	Reason for Inspection: Quarterly
Date of Last Post-Closure Inspection: 9/14/06	Reason for Last Post-Closure Inspection: Quarterly
Responsible Agency: Bechtel Nevada Environmental Restoration	
Address: Nevada Test Site, Mercury, Nevada	
Responsible Agency Official: Jeffrey L. Smith, Project Manager	

Chief Inspector: Glenn Richardson	Title: Task Manager	Organization: Environmental Restoration
Assistant Inspector: Shanghai Burnison	Title: Field Support Tech Lead	Organization: Environmental Restoration

A. GENERAL INSTRUCTIONS

1. All checklist items must be completed and detailed comments made to document the results of the site inspection. The completed checklist is part of the field record of the inspection. Additional pages should be used as necessary to ensure that a complete record is made. Attach the additional pages and number all pages upon completion of the inspection.
2. Any checklist line item marked by an inspector in a SHADED BOX must be fully explained or an appropriate reference to previous reports provided. The purpose of this requirement is to provide a written explanation of inspector observations and the inspector's rationale for conclusions and recommendations. Explanations are to be placed on additional attachments and cross-referenced appropriately. Explanations, in addition to narrative, will take the form of sketches, measurements, and annotated site maps.
3. The site inspection is a walking inspection of the entire site including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist.
4. A standard set of color photographs is required. In addition, all anomalous features or new features (such as changes in adjacent area land use) are to be photographed. A photograph log entry will be made for each photograph taken.
5. Field notes taken to assist in completion of this checklist will become part of the inspection record. No form is specified for field notes; however, they must be legible and in sufficient detail to enable review by succeeding inspectors and the responsible agency.
6. This unit will be inspected quarterly with formal reporting to the Nevada Division of Environmental Protection to be done annually. The annual report will include an executive summary, this inspection checklist with field notes and photograph log attached, and recommendations and conclusions.

B. PREPARATION (To be competed prior to site visit)	YES	NO	EXPLANATION
1. Has the Post-Closure Permit been reviewed?	✓		
2. Have the design basis documents been reviewed?	✓		
3. Have the site as-built plans and site base map been reviewed?	✓		
4. Have the previous inspection reports been reviewed?	✓		
a. Were anomalies or trends detected on previous inspections?		✓	
b. Was maintenance performed?	✓		Maintenance was performed to repair subsidence features on Dec. 13-14.
5. Have the site maintenance and repair records been reviewed?	✓		
a. Has site repair resulted in a change from as-built conditions?		✓	
b. Are revised as-built plans available that reflect repair changes?			N/A

C. SITE INSPECTION PREPARATION

Assemble the following, as needed, to conduct inspections:

a. Camera, film, and batteries
b. Keys to locks
c. Clipboard
d. Tape measure
e. Radio, pager, etc.
f. Previous Post-Closure Report, Inspection Checklists, repair records, and as-built plans
g. Other miscellaneous support equipment

CAU 110: AREA 3 WMD U-3nx/bl CRATER, POST-CLOSURE INSPECTION CHECKLIST

D. SITE INSPECTION	YES	NO	EXPLANATION
1. Adjacent off-site features:			
a. Have there been any changes in the use of the adjacent area?		✓	
b. Are there any new roads or trails?		✓	
c. Has there been any change in the position of nearby washes?		✓	
d. Has there been lateral excursion or erosion/deposition of nearby washes?		✓	
e. Are there new drainage channels?		✓	
f. Has there been a change in the surrounding vegetation?		✓	
2. Access roads, fences, gates, and signs:			
a. Is there a break in the fence?		✓	
b. Have any posts been damaged or their anchoring weakened?		✓	
c. Does the gate show evidence of tampering or damage?		✓	
d. Was the gate locked?	✓		
e. Is there any evidence of human intrusion onto the cover?		✓	
f. Is there any evidence of large animal intrusion onto the cover?		✓	
g. Have any signs been damaged or removed? (Number of signs replaced: ___)		✓	
h. Other?		✓	N/A
3. Monuments and other permanent features:			
a. Have survey markers, boundary monuments, or monitoring stations been disturbed?		✓	
b. Do natural processes threaten the integrity of any survey marker, boundary monument or monitoring station?		✓	
c. Is there excessive vegetation around the survey markers, boundary monuments, or monitoring stations?		✓	
d. Other?		✓	N/A
4. Waste unit cover:			
a. Is there evidence of settling?		✓	
b. Is there evidence of cracking?		✓	
c. Is there evidence of erosion (wind or water)?		✓	
d. Is there evidence of animal burrowing?	✓		Evidence of small animal burrows along the north/west edge of the cover
e. Is there a change in the vegetation growing on the cover not consistent with the naturally-occurring vegetation growing outside the unit?		✓	
g. Other (including trash, debris, etc within fenced area)?		✓	

CAU 110: AREA 3 WMD U-3ax/bl CRATER, POST-CLOSURE INSPECTION CHECKLIST

5. Photograph Instructions:

A total of 8 photographs are required to be taken during each inspection of CAU 110. Additional photographs may also be taken. The required photographs shall be taken as follows:

- Four (4) from the center of the unit, one in each compass direction (i.e., N, S, E, W) and
- Four (4) of the unit from outside the fence, one in each compass direction.

6. Photograph Documentation:	YES	NO	EXPLANATION
a. Have all photographs required by the photograph instructions been taken?	✓		
b. Has a photograph log been prepared? (Number of photographs taken: 8)	✓		
c. Other?		✓	

E. FIELD CONCLUSIONS

1. Is there an imminent hazard to the integrity of the unit? (Immediate report required)		✓	

Person/Agency to whom report was made:

2. Are more frequent inspections required?		✓	
3. Are existing maintenance/repair actions satisfactory?	✓		
4. Is other maintenance/repair necessary?		✓	

5. Field conclusions/recommendations: The signage, fencing, and vegetative cover were in good condition. There was no evidence of new subsidence features on the cover since the last subsidence repair. There were some small animal burrows discovered along the northwest edge of the cover. No action is necessary at this time.

F. CERTIFICATION

I have conduction an inspection of CAU 110, Area 3 WMD U-3ax/bl Crater, in accordance with the procedures of the Post-Closure Permit (including the Post-Closure Plan) as recorded on this checklist, attached sheets, field notes, photographs, and photograph logs.

Chief Inspector's Signature:	Date: 12/20/06
Printed Name: Glenn Richardson	Title: Task Manager

CAU 110: AREA 3 WMD U-3ax/bl CRATER, POST-CLOSURE INSPECTION CHECKLIST

Inspection Date and Time: 3/29/07	Reason for Inspection: Quarterly
Date of Last Post-Closure Inspection: 12/20/06	Reason for Last Post-Closure Inspection: Quarterly
Responsible Agency: Bechtel Nevada Environmental Restoration	
Address: Nevada Test Site, Mercury, Nevada	
Responsible Agency Official: Jeffrey L. Smith, Project Manager	

Chief Inspector: Glenn Richardson	Title: Task Manager	Organization: Environmental Restoration
Assistant Inspector: Rob Baumert	Title: Field Tech Lead	Organization: Environmental Restoration

A. GENERAL INSTRUCTIONS

1. All checklist items must be completed and detailed comments made to document the results of the site inspection. The completed checklist is part of the field record of the inspection. Additional pages should be used as necessary to ensure that a complete record is made. Attach the additional pages and number all pages upon completion of the inspection.
2. Any checklist line item marked by an inspector in a SHADED BOX must be fully explained or an appropriate reference to previous reports provided. The purpose of this requirement is to provide a written explanation of inspector observations and the inspector's rationale for conclusions and recommendations. Explanations are to be placed on additional attachments and cross-referenced appropriately. Explanations, in addition to narrative, will take the form of sketches, measurements, and annotated site maps.
3. The site inspection is a walking inspection of the entire site including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist.
4. A standard set of color photographs is required. In addition, all anomalous features or new features (such as changes in adjacent area land use) are to be photographed. A photograph log entry will be made for each photograph taken.
5. Field notes taken to assist in completion of this checklist will become part of the inspection record. No form is specified for field notes, however, they must be legible and in sufficient detail to enable review by succeeding inspectors and the responsible agency.
6. This unit will be inspected quarterly with formal reporting to the Nevada Division of Environmental Protection to be done annually. The annual report will include an executive summary, this inspection checklist with field notes and photograph log attached, and recommendations and conclusions.

B. PREPARATION (To be competed prior to site visit)	YES	NO	EXPLANATION
1. Has the Post-Closure Permit been reviewed?	✓		
2. Have the design basis documents been reviewed?	✓		
3. Have the site as-built plans and site base map been reviewed?	✓		
4. Have the previous inspection reports been reviewed?	✓		
a. Were anomalies or trends detected on previous inspections?		✓	
b. Was maintenance performed?	✓		The most recent maintenance/repair was performed on Dec. 13, 2006.
5. Have the site maintenance and repair records been reviewed?	✓		
a. Has site repair resulted in a change from as-built conditions?		✓	
b. Are revised as-built plans available that reflect repair changes?			N/A

C. SITE INSPECTION PREPARATION

Assemble the following, as needed, to conduct inspections:

a. Camera, film, and batteries
b. Keys to locks
c. Clipboard
d. Tape measure
e. Radio, pager, etc.
f. Previous Post-Closure Report, Inspection Checklists, repair records, and as-built plans
g. Other miscellaneous support equipment

CAU 110: AREA 3 WMD U-3ax/bl CRATER, POST-CLOSURE INSPECTION CHECKLIST

D. SITE INSPECTION	YES	NO	EXPLANATION
1. Adjacent off-site features:			
a. Have there been any changes in the use of the adjacent area?		✓	
b. Are there any new roads or trails?		✓	
c. Has there been any change in the position of nearby washes?		✓	
d. Has there been lateral excursion or erosion/deposition of nearby washes?		✓	
e. Are there new drainage channels?		✓	
f. Has there been a change in the surrounding vegetation?		✓	Vegetation appears to remain in good condition.
2. Access roads, fences, gates, and signs:			
a. Is there a break in the fence?		✓	
b. Have any posts been damaged or their anchoring weakened?		✓	
c. Does the gate show evidence of tampering or damage?		✓	
d. Was the gate locked?	✓		
e. Is there any evidence of human intrusion onto the cover?		✓	
f. Is there any evidence of large animal intrusion onto the cover?		✓	
g. Have any signs been damaged or removed? (Number of signs replaced: ___)		✓	
h. Other?		✓	
3. Monuments and other permanent features:			
a. Have survey markers, boundary monuments, or monitoring stations been disturbed?		✓	
b. Do natural processes threaten the integrity of any survey marker, boundary monument or monitoring station?		✓	
c. Is there excessive vegetation around the survey markers, boundary monuments, or monitoring stations?		✓	
d. Other?		✓	
4. Waste unit cover:			
a. Is there evidence of settling?	✓		
b. Is there evidence of cracking?	✓		Cracks were discovered on the northeast edge of the cover.
c. Is there evidence of erosion (wind or water)?		✓	
d. Is there evidence of animal burrowing?	✓		A large amount of animal burrows were noticed on the cover.
e. Is there a change in the vegetation growing on the cover not consistent with the naturally-occurring vegetation growing outside the unit?		✓	
g. Other (including trash, debris, etc within fenced area)?		✓	

CAU 110: AREA 3 WMD U-3ax/bl CRATER, POST-CLOSURE INSPECTION CHECKLIST

5. Photograph Instructions:

A total of 8 photographs are required to be taken during each inspection of CAU 110. Additional photographs may also be taken. The required photographs shall be taken as follows:

- Four (4) from the center of the unit, one in each compass direction (i.e., N, S, E, W) and
- Four (4) of the unit from outside the fence, one in each compass direction.

6. Photograph Documentation:	YES	NO	EXPLANATION
a. Have all photographs required by the photograph instructions been taken?	✓		
b. Has a photograph log been prepared? (Number of photographs taken: 18)	✓		Additional photos were taken of the subsidence cracks and animal burrows.
c. Other*		✓	

E. FIELD CONCLUSIONS

1. Is there an imminent hazard to the integrity of the unit? (Immediate report required)		✓	
Person/Agency to whom report was made:			
2. Are more frequent inspections required?		✓	
3. Are existing maintenance/repair actions satisfactory?	✓		
4. Is other maintenance/repair necessary?	✓		Repairs are necessary for the subsidence cracks that were discovered.

5. Field conclusions/recommendations: The fencing, signage, and vegetative cover were in good condition. However, settling imperfections (cracks) were discovered greater than 6 inches deep that extended approx. 3-4 feet on the northeast edge of the cover. Photos were taken and repairs are necessary within 60 days. Also, a significant amount of animal burrows were discovered on the cover. Ecological services will be contacted within 60 days.

F. CERTIFICATION

I have conduction an inspection of CAU 110, Area 3 WMD U-3ax/bl Crater, in accordance with the procedures of the Post-Closure Permit (including the Post-Closure Plan) as recorded on this checklist, attached sheets, field notes, photographs, and photograph logs.

Chief Inspector's Signature:	Date: 3/29/07
Printed Name: Glenn Richardson	Title: Task Manager

CAU 110: AREA 3 WMD U-3ax/bl CRATER, POST-CLOSURE INSPECTION CHECKLIST

Inspection Date and Time: 06/04/07 0945	Reason for Inspection: Quarterly
Date of Last Post-Closure Inspection: 03/29/07	Reason for Last Post-Closure Inspection: Quarterly
Responsible Agency: National Security Technologies - Environmental Restoration	
Address: Nevada Test Site, Mercury, Nevada	
Responsible Agency Official: Jeffrey L. Smith, Project Manager	

Chief Inspector: Glenn Richardson	Title: Task Manager	Organization: Environmental Restoration
Assistant Inspector: Reed Poderis	Title: ER Technical Manager	Organization: Environmental Restoration

A. GENERAL INSTRUCTIONS

1. All checklist items must be completed and detailed comments made to document the results of the site inspection. The completed checklist is part of the field record of the inspection. Additional pages should be used as necessary to ensure that a complete record is made. Attach the additional pages and number all pages upon completion of the inspection.
2. Any checklist line item marked by an inspector in a SHADED BOX must be fully explained or an appropriate reference to previous reports provided. The purpose of this requirement is to provide a written explanation of inspector observations and the inspector's rationale for conclusions and recommendations. Explanations are to be placed on additional attachments and cross-referenced appropriately. Explanations, in addition to narrative, will take the form of sketches, measurements, and annotated site maps.
3. The site inspection is a walking inspection of the entire site including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist.
4. A standard set of color photographs is required. In addition, all anomalous features or new features (such as changes in adjacent area land use) are to be photographed. A photograph log entry will be made for each photograph taken.
5. Field notes taken to assist in completion of this checklist will become part of the inspection record. No form is specified for field notes; however, they must be legible and in sufficient detail to enable review by succeeding inspectors and the responsible agency.
6. This unit will be inspected quarterly with formal reporting to the Nevada Division of Environmental Protection to be done annually. The annual report will include an executive summary, this inspection checklist with field notes and photograph log attached, and recommendations and conclusions.

B. PREPARATION (To be competed prior to site visit)	YES	NO	EXPLANATION
1. Has the Post-Closure Permit been reviewed?	✓		
2. Have the design basis documents been reviewed?	✓		
3. Have the site as-built plans and site base map been reviewed?	✓		
4. Have the previous inspection reports been reviewed?	✓		
a. Were anomalies or trends detected on previous inspections?		✓	
b. Was maintenance performed?	✓		Subsidence crack repairs on the east edge of the soil cover were completed on May 14, 2007.
5. Have the site maintenance and repair records been reviewed?	✓		
a. Has site repair resulted in a change from as-built conditions?		✓	
b. Are revised as-built plans available that reflect repair changes?			N/A

C. SITE INSPECTION PREPARATION

Assemble the following, as needed, to conduct inspections:

a. Camera, film, and batteries
b. Keys to locks
c. Clipboard
d. Tape measure
e. Radio, pager, etc.
f. Previous Post-Closure Report, Inspection Checklists, repair records, and as-built plans
g. Other miscellaneous support equipment

CAU 110: AREA 3 WMD U-3ax/bl CRATER, POST-CLOSURE INSPECTION CHECKLIST

D. SITE INSPECTION	YES	NO	EXPLANATION
1. Adjacent off-site features:			
a. Have there been any changes in the use of the adjacent area?		✓	
b. Are there any new roads or trails?		✓	
c. Has there been any change in the position of nearby washes?		✓	
d. Has there been lateral excursion or erosion/deposition of nearby washes?		✓	
e. Are there new drainage channels?		✓	
f. Has there been a change in the surrounding vegetation?		✓	
2. Access roads, fences, gates, and signs:			
a. Is there a break in the fence?		✓	
b. Have any posts been damaged or their anchoring weakened?		✓	
c. Does the gate show evidence of tampering or damage?		✓	
d. Was the gate locked?	✓		
e. Is there any evidence of human intrusion onto the cover?		✓	
f. Is there any evidence of large animal intrusion onto the cover?		✓	
g. Have any signs been damaged or removed? (Number of signs replaced: ___)		✓	
h. Other?			N/A
3. Monuments and other permanent features:			
a. Have survey markers, boundary monuments, or monitoring stations been disturbed?		✓	
b. Do natural processes threaten the integrity of any survey marker, boundary monument or monitoring station?		✓	
c. Is there excessive vegetation around the survey markers, boundary monuments, or monitoring stations?		✓	
d. Other?			N/A
4. Waste unit cover:			
a. Is there evidence of settling?		✓	
b. Is there evidence of cracking?		✓	Cracks identified during the March 2007 inspection were repaired on May 14, 2007.
c. Is there evidence of erosion (wind or water)?		✓	
d. Is there evidence of animal burrowing?	✓		There is some evidence of animal burrowing; however, approx. 50 small mammals were captured in traps. We should see a significant decline of animal burrows during the next quarterly inspection.
e. Is there a change in the vegetation growing on the cover not consistent with the naturally-occurring vegetation growing outside the unit?		✓	
g. Other (including trash, debris, etc within fenced area)?		✓	

CAU 110: AREA 3 WMD U-3ax/bl CRATER, POST-CLOSURE INSPECTION CHECKLIST

5. Photograph Instructions:

A total of 8 photographs are required to be taken during each inspection of CAU 110. Additional photographs may also be taken. The required photographs shall be taken as follows:

- Four (4) from the center of the unit, one in each compass direction (i.e., N, S, E, W) and
- Four (4) of the unit from outside the fence, one in each compass direction.

6. Photograph Documentation:	YES	NO	EXPLANATION
a. Have all photographs required by the photograph instructions been taken?	✓		
b. Has a photograph log been prepared? (Number of photographs taken: 8)	✓		
c. Other?			N/A

E. FIELD CONCLUSIONS

1. Is there an imminent hazard to the integrity of the unit? (immediate report required)		✓	
Person/Agency to whom report was made:			
2. Are more frequent inspections required?		✓	
3. Are existing maintenance/repair actions satisfactory?	✓		Subsidence crack repairs performed in May 2007 are holding very well.
4. Is other maintenance/repair necessary?		✓	

5. Field conclusions/recommendations: The signage, monuments, and fencing are in excellent condition. Subsidence crack repairs that were performed in May 2007 are holding very well. There were some animal burrows noticed; however, approx. 50 small mammals were captured in early May 2007. As a result, the burrowing is expected to significantly decline during the next quarterly inspection in September 2007.

F. CERTIFICATION

I have conduction an inspection of CAU 110, Area 3 WMD U-3ax/bl Crater, in accordance with the procedures of the Post-Closure Permit (including the Post-Closure Plan) as recorded on this checklist, attached sheets, field notes, photographs, and photograph logs.

Chief Inspector's Signature:	Date: 06/04/07
Printed Name: Glenn Richardson	Title: Task Manager

CAU 91, 92, 110, 112 Semi-annual inspections

Personnel: Shaughn Burnison
Mike Floyd
Melissa Cabble

Weather: Hot, 90's, no wind

Scope: Conduct Semi-annual inspections at CAU 91, 92, 110, 112 post-closure sites

9:25 AM Arrive on-site at CAU 91
Cover: No vegetation present
No cracking or erosion
Signs: All in good condition
All afixed properly
Fence: gate was locked
: All posts and chain link in like new condition
Monuments: All standing upright
: No cracking or chipping noted

The overall condition of the site is good. No maintence / repairs are required.

9:45 Arrive at CAU 110.
Cover: vegetation looks good
: no animal burrows
: On SE portion of the cover settling was noted in the previous location of ~~@~~ repair. Cracks were also noted in the settling area.
Signs: All readable and in good condition
fence: gate was locked
: no breaks or knocked down wire
: Some tumbleweeds were noted on the SW portion of the fence. They did not seem to impact the site and should be blown away by the wind.

All signs and fencing ~~was~~ are mc in good condition. Some settling was identified in a previous area with cracks as well. The repair done to the SE portion of the cover is not holding well due to this settling.

Work continued from Page 152

CAU 262 (CAS 25-02-06) AREA 25 SEPTIC SYSTEM AND UNDERGROUND DISCHARGE POINT

ONE SIGN DOWN. NO FENCE. NO INTRUSION OR EROSION. NO CHANGES IN NEARBY VICINITY. FOLLOWUP ACTION: REMOUNT SIGN

CAU 165 (CAS 25-20-01) AREA 25 LAB DRAIN DRY WELL

2 SIGNS. NO EROSION OR UNACCEPTABLE INTRUSION (PARKING AREA). A-OK. NO FOLLOWUP ACTION REQUIRED.

RCRA Post Closure Inspections - Dec. 20, 2006

CAUs: 90, 92, 110, + 112

CAU 91 does not require an inspection at this time.

Personnel: Glenn Richardson NSTec Task Manager
Shaughn Burnison NSTec Field Support Technical Lead

Visitors: Ted Zaferatos - NDEP
Dennis Nicodemus - NDEP

Work continued to Page 154

SIGNATURE | DATE

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

was also on the northeast ~~edge~~ corner of the cover. It was decided that a follow-up action was not required. The small vegetation will be monitored and if it increases in the spring season, it will be removed.

NDEP noticed damage to the wave barriers. The wave barriers were damaged in a couple of different locations. Maintenance is necessary within 60 Days. Subsidence surveys were done on 12/12/0 11:25AM-Photos were taken and we left the site heading to Mercury for lunch.

12:00 PM - Lunch

12:20 PM - Left Cafeteria, heading to CAU 112

12:27 PM - Arrived at CAU 112 - A-23 Waste Trenches
Performed drive-around inspection.
No concerns or issues at this site.
The site is in overall good condition.

12:40 PM - NDEP departed from CAU 112.

RCRA Inspections completed on Dec. 20, 2006.

SIGNATURE			DATE
DISCLOSED TO AND UNDERSTOOD BY	DATE	WITNESS	DATE

156 TITLE

PROJECT NO.

Work continued from Page ____

BOOK NO.

RCRA Post Closure Inspections - March 29, 2007

Personnel: Glenn Richardson - NSTec Task Manager
Rob Baumert - NSTec Field Support Tech Lead

Visitors: Ted Zaferatos - NDEP
Greg Doyle - NSTec Engineering (CAU 110 Only)

Scope: Perform quarterly and semiannual post closure site inspections for the following CAUs: 91, 92, 110, and 112

9:05AM - Arrived at CAU 91 (Injection Well 4350) and prepared for the safety briefing and post closure inspection.

9:10AM - Performed the Tailgate Safety Briefing. Discussed slips/trips/falls. Discussed standard Level D PPE (safety glasses, substantial footwear, etc.) Discussed heat stress conditions and nearest medical location.

9:15AM - Performed semiannual inspection and noticed the signs and fencing were in good condition. There was vegetation that had grown along the edge of the aboveground monument concrete pad. This will have to be removed (within 60 days). There was no evidence of burrows. Left CAU 91 at 9:25AM.

9:30AM - Arrived at CAU 110 (Area 3 WMD U-3ax/bl) to perform quarterly inspection. We discovered settling imperfections (cracks) greater than 6 in. deep that extended approx. 3-4 ft. on the northeast edge of the cover. Repairs are necessary with engineering oversight present onsite. Photos were taken. The signage and fencing looked

Work continued to Page 157

SIGNATURE			DATE 3/29/07
DISCLOSED TO AND UNDERSTOOD BY	DATE	WITNESS	DATE

good; Aswell as the vegetative cover. Also, a large amount of animal burrows were noticed on the cover. Ecological services will be contacted to do small mammal trapping. Left CAU 110 at 10:20 AM.

10:35 AM - Arrived at CAU 92 (Decon Pond) to perform quarterly inspection. Noticed an increase in vegetation growth sience the last quarterly in Dec. 2006. Vegetation is on the southwest corner of the cover and the outside perimeter of the cover. There was no evidence of animal burrowing. Also, the signs, fencing, and wave barriers are in good condition. Left CAU 92 at 10:50 AM.

Traveled back to Mercury for lunch. We will regroup with NDEP (Ted) at 12:00 PM to perform our quarterly inspection at CAU 112.

12:03 PM - Arrived at CAU 112 (Area 23 Waste Trenches) to perform our site inspections. The signage, fencing, and monuments were in good condition. Vegetation growth was noticed in different areas on the cover. Removal is necessary (within 60 days).

12:12 PM - End of RCRA inspections.

Work continued to Page

SIGNATURE DATE 3/29/07

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

Quarterly RCRA Post Closure Inspection of CAU 110 - 6/04/07

Photos Taken of CAU 110
U-3ax/bl:

Photos: ⑤ Facing South ① North
⑥ Facing West ② East
⑦ Facing North ③ South
⑧ Facing North East ④ West

Scope:
Post closure inspection was performed in conjunction with the CEI inspection of the Area 3 U-3ax/bl site (CAU 110).

Personnel: Glenn Richardson, Task Manager
Reed Poderis, ER Technical Manager
Visitors: Ted Zaferatos, NDEP Lead
Dennis Nicodemus, NDEP
Ken Small, NNSA CEI Lead
Janis Ramos, NNSA
Dodie Haworth, NSTec Env. Compliance
Carl Suong, NSTec Env. Compliance

Equipment: Camera
Weather: Clear Skies 88° Temp.

Tailgate Safety Briefing: 9:50AM We discussed the scope of work, rad hazards with a URMA, and PPE requirements (substantial footwear, safety glasses) Slips/trips/falls, biological hazards, and heat stress conditions.

10:00AM - Everyone signed the access log for Area 3 RWMS. There was a misunderstanding that access to U3ax/bl site required access into the Area 3 RWMS; however, since an ER gate has been installed outside of the Area 3 RWMS

Work continued to Page 164

SIGNATURE			DATE 06/04/07
DISCLOSED TO AND UNDERSTOOD BY	DATE	WITNESS	DATE

compound, and direct access is possible to the RCRA site, Area 3 RWMS requirements are no longer applicable. Future notifications to the Area 3 RWMS facility owner might be made as a courtesy, but are not longer required.

10:15 AM - Performed the site inspection. Identified the most recent repairs that were made to subsidence cracks discovered during the March inspection period. The repairs are holding very well and NDEP was pleased with the current site conditions. The fencing, monuments, and signage were in great condition. There were no new subsidence features discovered that required notification. Animal burrows were noticed at the site; however, since the small mammal trappings in early May 2007, we should expect a significant decline of burrows during the next quarterly inspection in Sept. 2007. Overall site conditions were good resulting in no observations or findings.

10:45 AM - Inspection of U-3ax/bl site ended. NNSA and NDEP departed from the site.

Work continued to Page _____

SIGNATURE

DATE 06/04/07

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

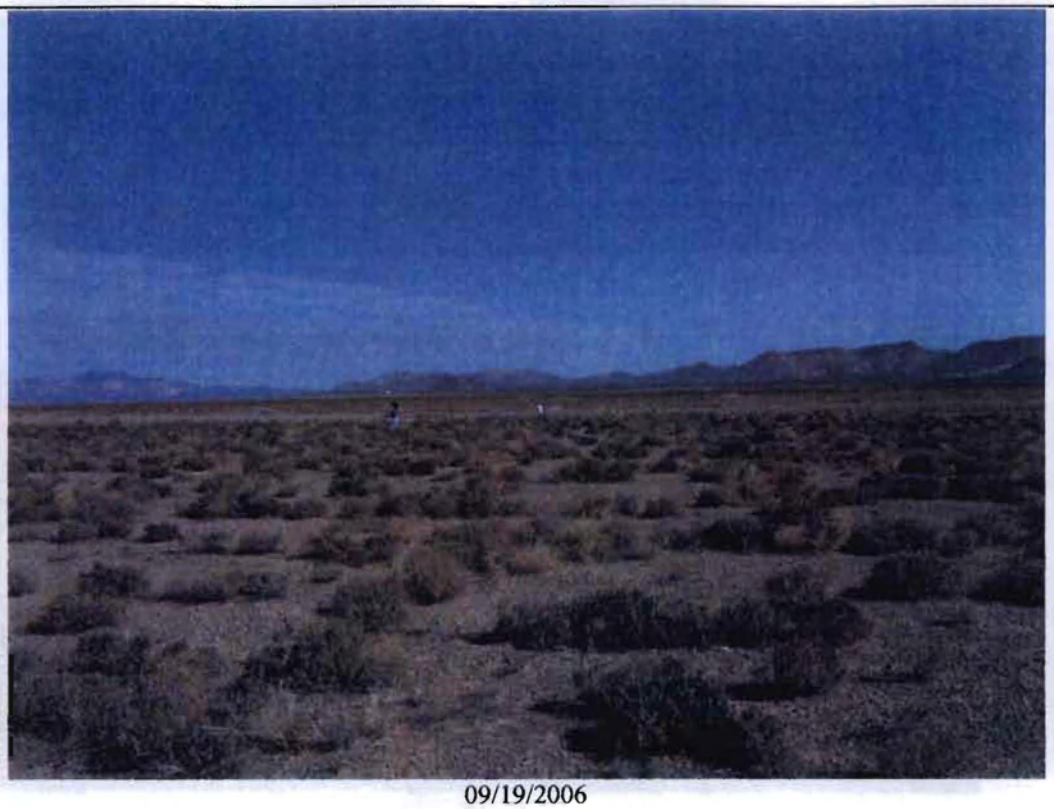
DATE

PHOTOGRAPH LOG

PHOTOGRAPH NUMBER	DATE	DESCRIPTION
1	09/19/2006	View from center of Area 3 WMD U-3ax/bl cover looking northeast.
2	09/19/2006	View from center of Area 3 WMD U-3ax/bl cover looking northwest.
3	09/19/2006	View from center of Area 3 WMD U-3ax/bl cover looking southeast.
4	09/19/2006	View from center of Area 3 WMD U-3ax/bl cover looking southwest.
5	09/19/2006	View from Area 3 WMD U-3ax/bl fence looking northeast.
6	09/19/2006	View from Area 3 WMD U-3ax/bl fence looking northwest.
7	09/19/2006	View from Area 3 WMD U-3ax/bl fence looking southeast.
8	09/19/2006	View from Area 3 WMD U-3ax/bl fence looking southwest.
9	11/01/2006	View of subsidence on the southeast edge of the Area 3 WMD U-3ax/bl cover.
10	11/06/2006	View of cracking on the southeast edge of the Area 3 WMD U-3ax/bl cover.
11	11/08/2006	View of subsidence on the southeast edge of the Area 3 WMD U-3ax/bl cover.
12	12/13/2006	View of repairs the southeast edge of the Area 3 WMD U-3ax/bl cover.
13	12/20/2006	View from center of Area 3 WMD U-3ax/bl cover looking northeast.
14	12/20/2006	View from center of Area 3 WMD U-3ax/bl cover looking northwest.
15	12/20/2006	View from center of Area 3 WMD U-3ax/bl cover looking southeast.
16	12/20/2006	View from center of Area 3 WMD U-3ax/bl cover looking southwest.
17	12/20/2006	View from Area 3 WMD U-3ax/bl fence looking northeast.
18	12/20/2006	View from Area 3 WMD U-3ax/bl fence looking northwest.
19	12/20/2006	View from Area 3 WMD U-3ax/bl fence looking southeast.
20	12/20/2006	View from Area 3 WMD U-3ax/bl fence looking southwest.
21	03/29/2007	View from center of Area 3 WMD U-3ax/bl cover looking northeast.
22	03/29/2007	View from center of Area 3 WMD U-3ax/bl cover looking northwest.
23	03/29/2007	View from center of Area 3 WMD U-3ax/bl cover looking southeast.
24	03/29/2007	View from center of Area 3 WMD U-3ax/bl cover looking southwest.
25	03/29/2007	View from Area 3 WMD U-3ax/bl fence looking northeast.
26	03/29/2007	View from Area 3 WMD U-3ax/bl fence looking northwest.
27	03/29/2007	View from Area 3 WMD U-3ax/bl fence looking southeast.
28	03/29/2007	View from Area 3 WMD U-3ax/bl fence looking southwest.
29	05/14/2007	View of subsidence on the northeast edge of the Area 3 WMD U-3ax/bl cover.
30	05/14/2007	View of repairs of the northeast edge of the Area 3 WMD U-3ax/bl cover.
31	06/04/2007	View from center Area 3 WMD U-3ax/bl Crater cover looking north.

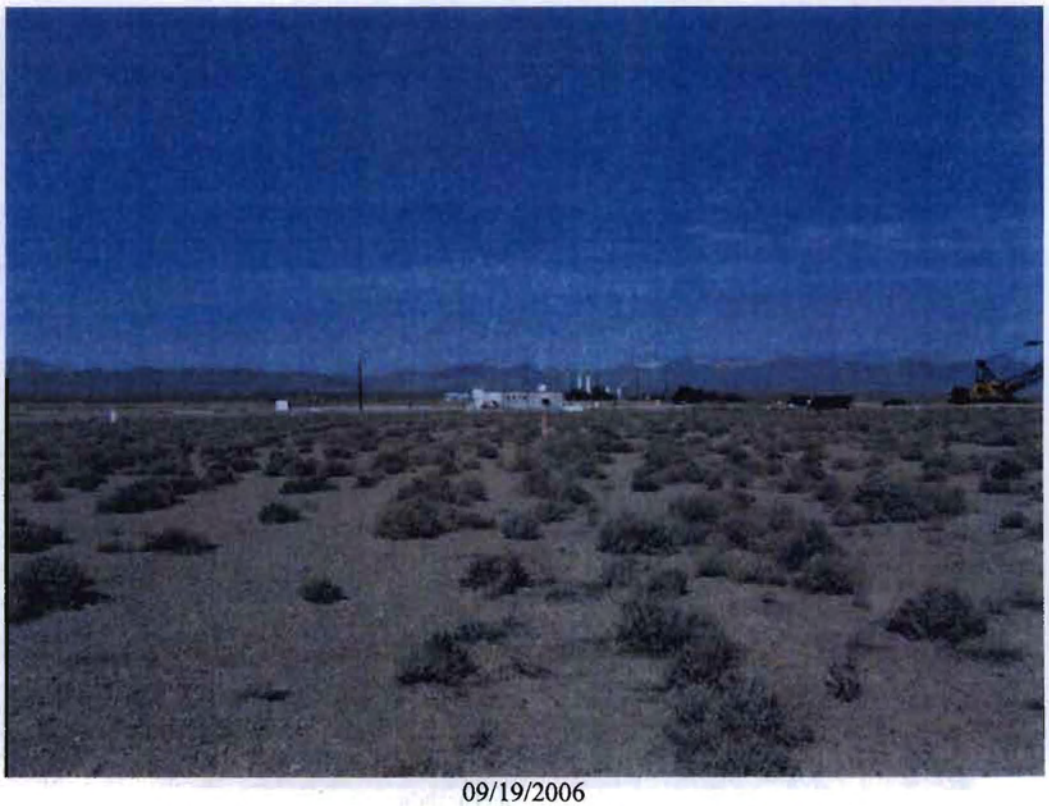
PHOTOGRAPH LOG

PHOTOGRAPH NUMBER	DATE	DESCRIPTION
32	06/04/2007	View from center Area 3 WMD U-3ax/bl Crater cover looking east.
33	06/04/2007	View from center Area 3 WMD U-3ax/bl Crater cover looking south.
34	06/04/2007	View from center Area 3 WMD U-3ax/bl Crater cover looking west.
35	06/04/2007	View from Area 3 WMD U-3ax/bl fence looking north.
36	06/04/2007	View from Area 3 WMD U-3ax/bl fence looking east.
37	06/04/2007	View from Area 3 WMD U-3ax/bl fence looking west.
38	06/04/2007	View from Area 3 WMD U-3ax/bl fence looking south.



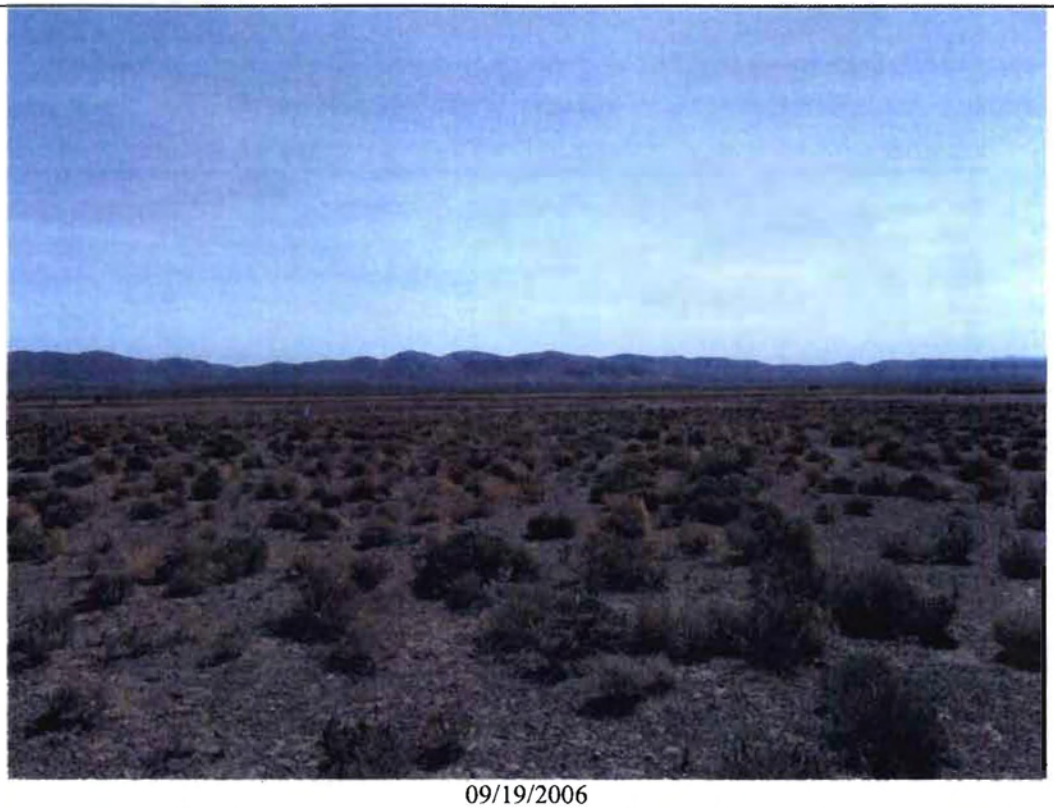
09/19/2006

1. View from center of Area 3 WMD U-3ax/bl cover looking northeast.

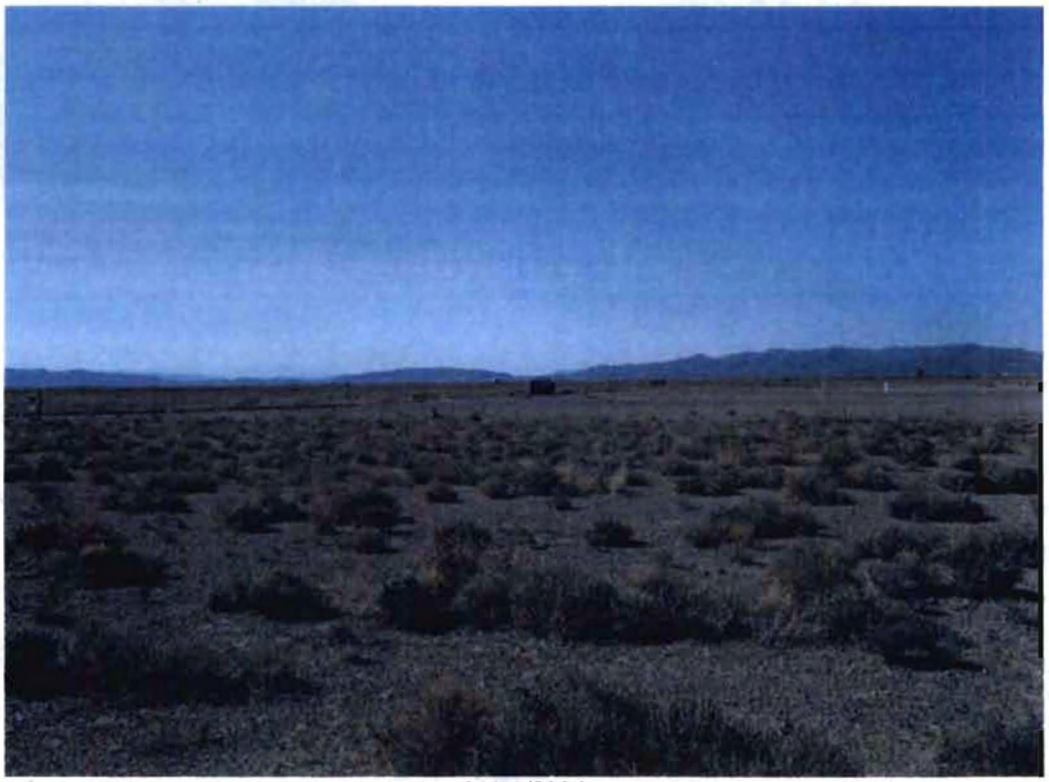


09/19/2006

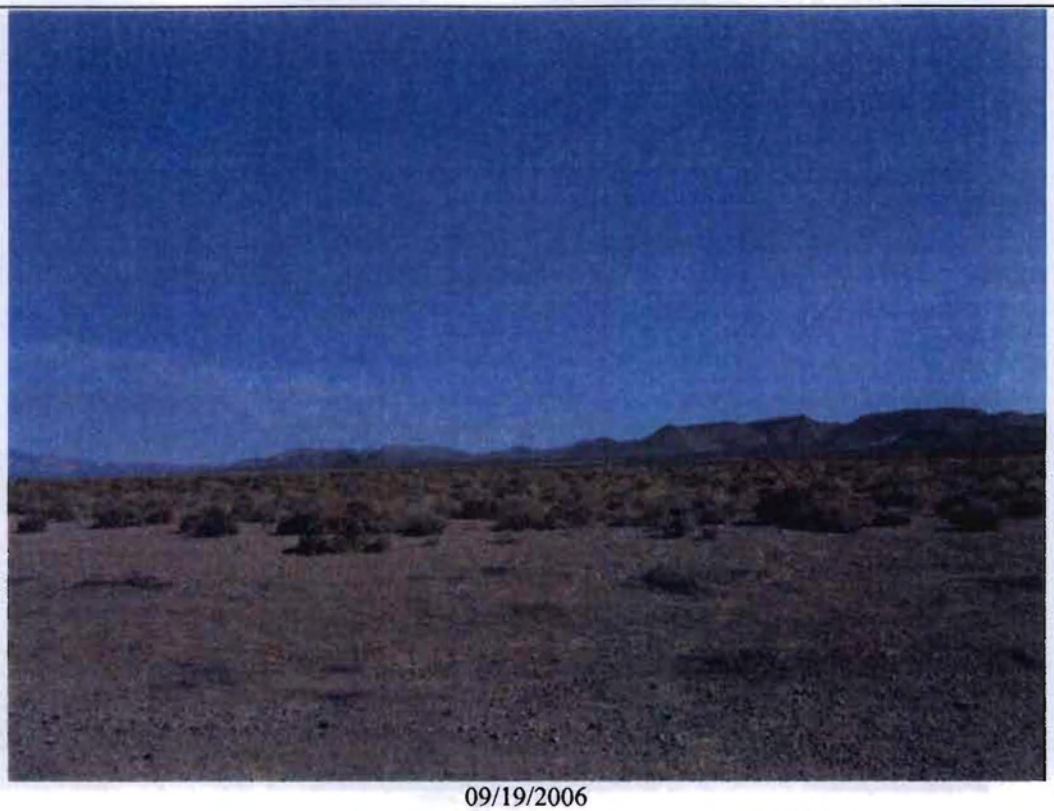
2. View from center of Area 3 WMD U-3ax/bl cover looking northwest.



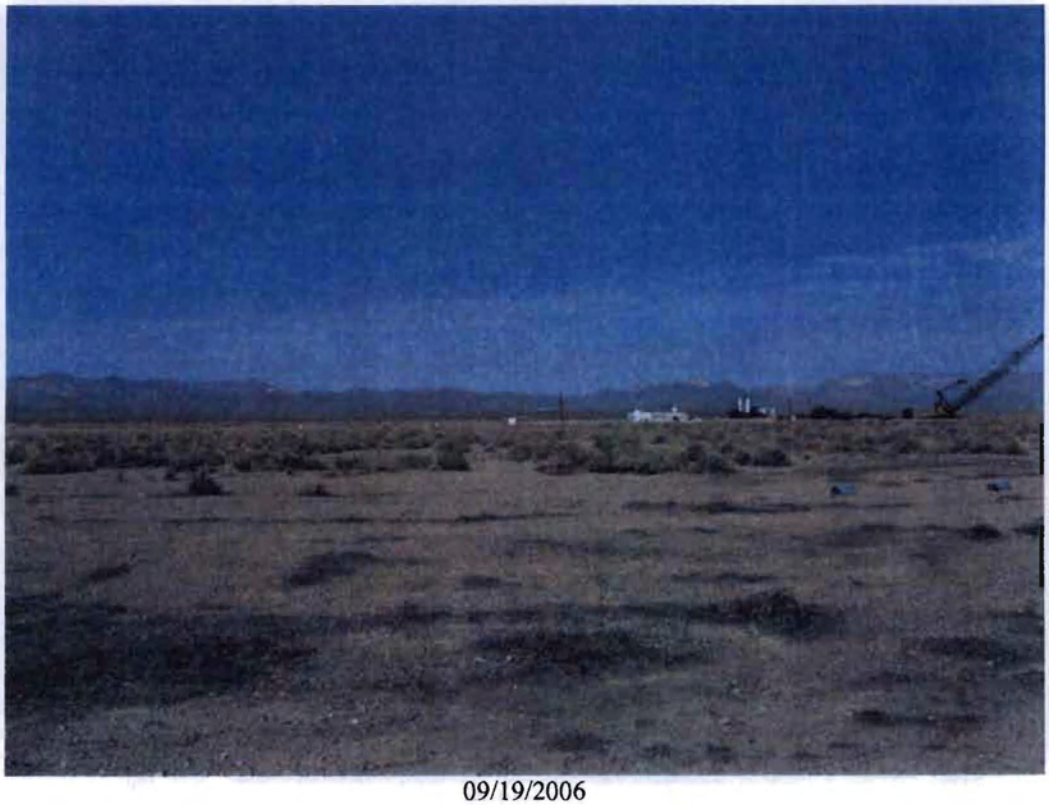
09/19/2006
3. View from center of Area 3 WMD U-3ax/bl cover looking southeast.



09/19/2006
4. View from center of Area 3 WMD U-3ax/bl cover looking southwest.



09/19/2006
5. View from Area 3 WMD U-3ax/bl fence looking northeast.



09/19/2006
6. View from Area 3 WMD U-3ax/bl fence looking northwest.

09/19/2006
7. View from Area 3 WMD U-3ax/bl fence looking southeast.

09/19/2006
8. View from Area 3 WMD U-3ax/bl fence looking southwest.

11/01/2006
9. View of subsidence on the southeast edge of the Area 3 WMD U-3ax/bl cover.

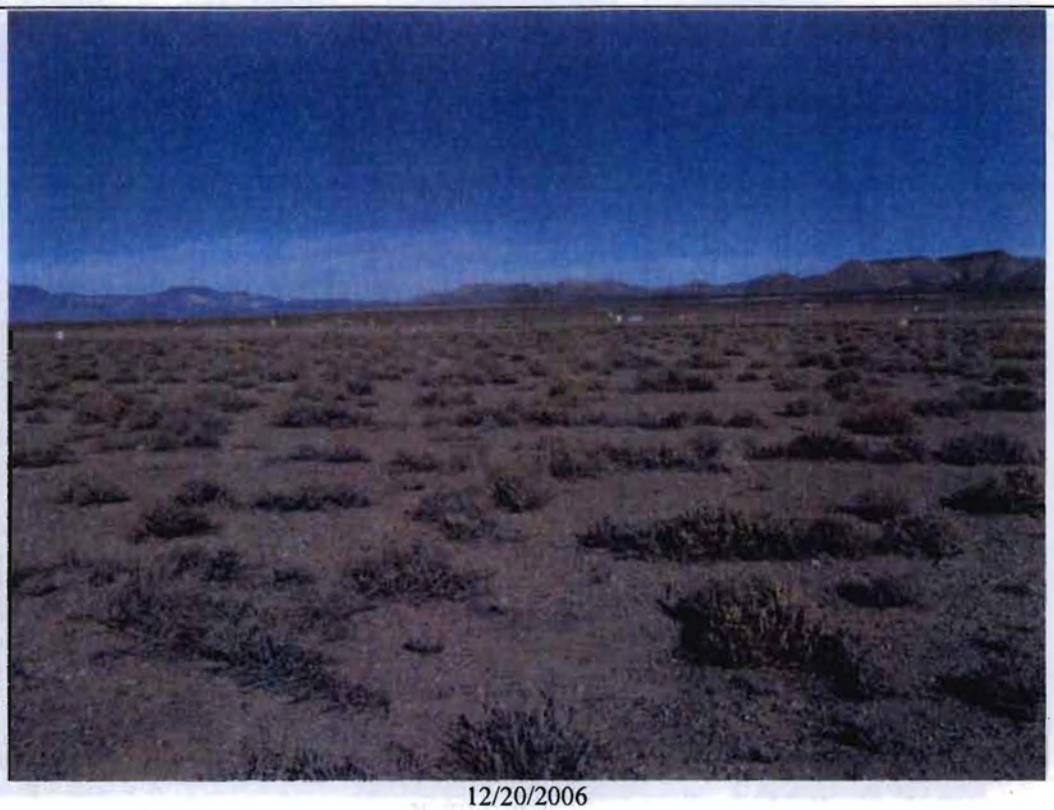
11/06/2006
10. View of cracking on the southeast edge of the Area 3 WMD U-3ax/bl cover.

11/08/2006

11. View of subsidence on the southeast edge of the Area 3 WMD U-3ax/bl cover.

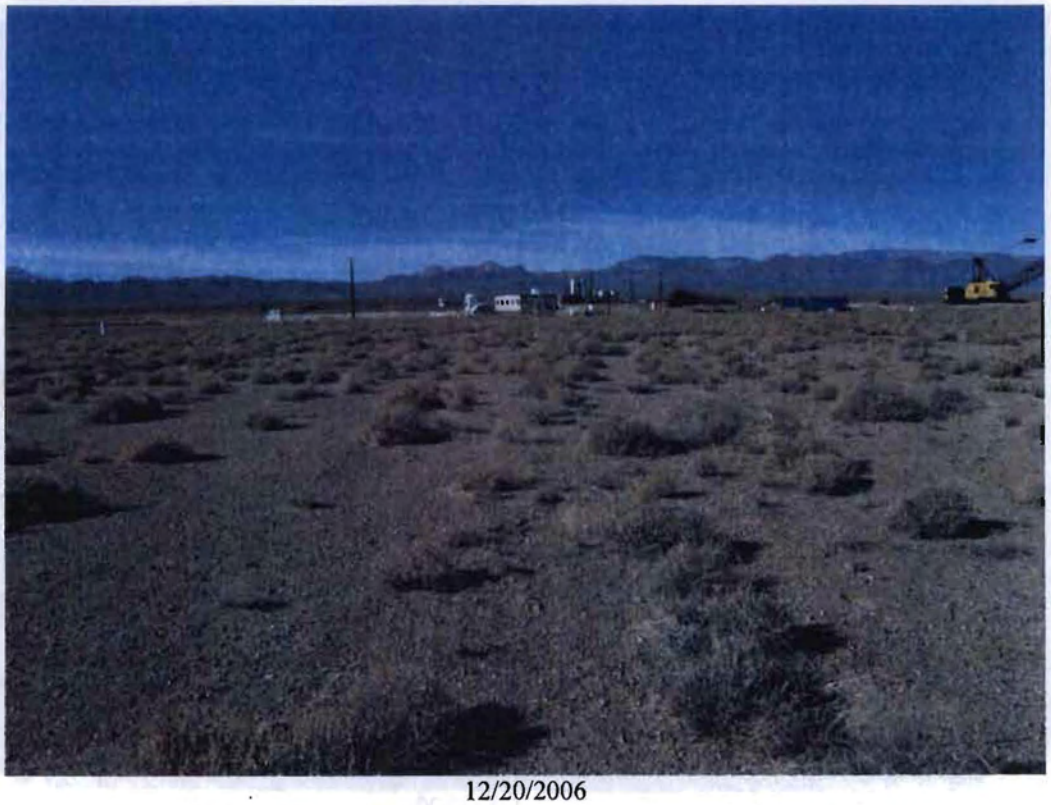
12/13/2006

12. View of repairs of the southeast edge of the Area 3 WMD U-3ax/bl cover.



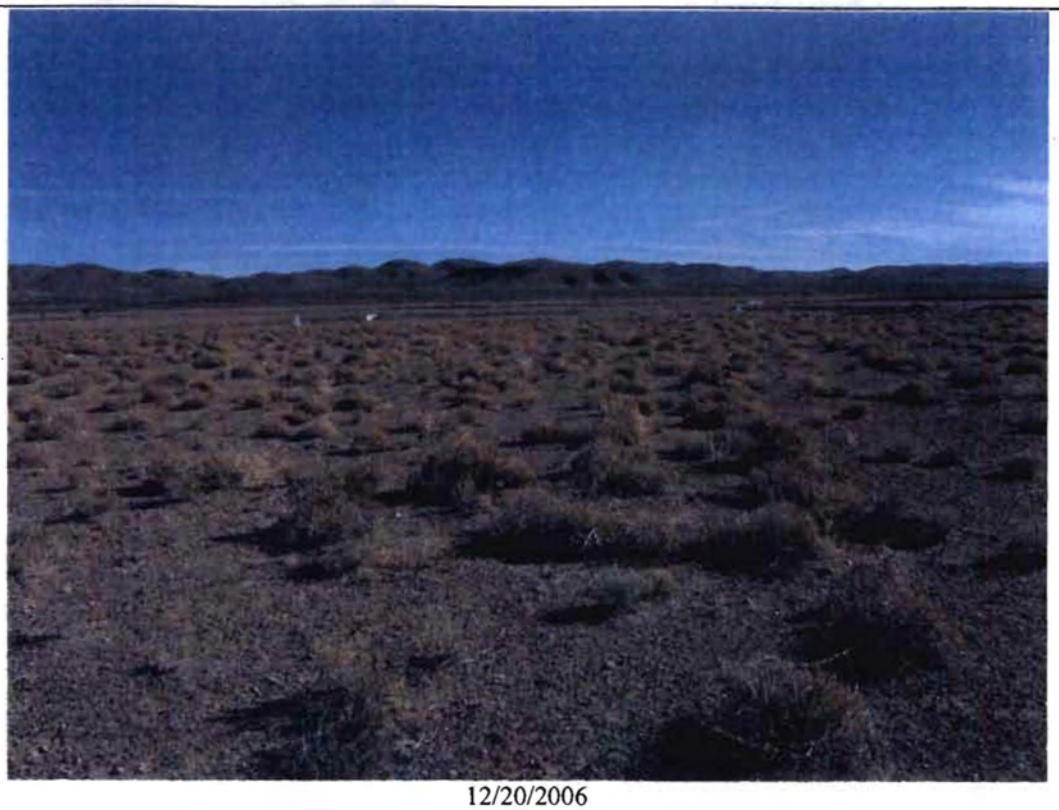
12/20/2006

13. View from center of Area 3 WMD U-3ax/bl cover looking northeast.

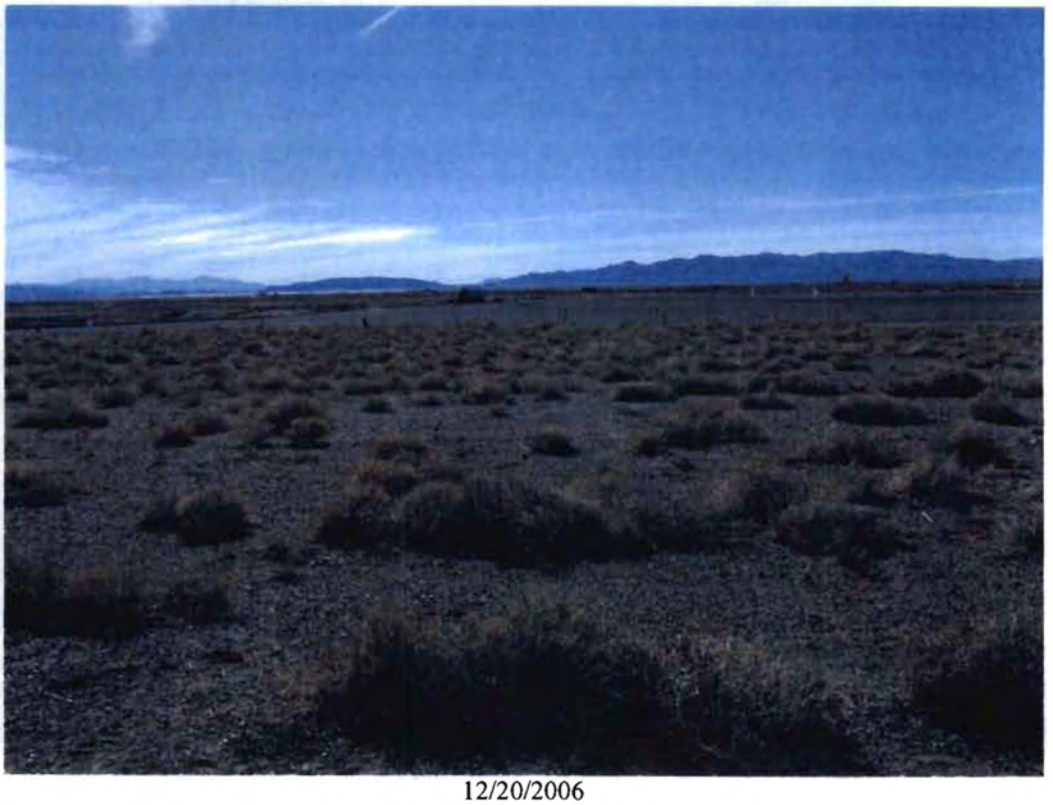


12/20/2006

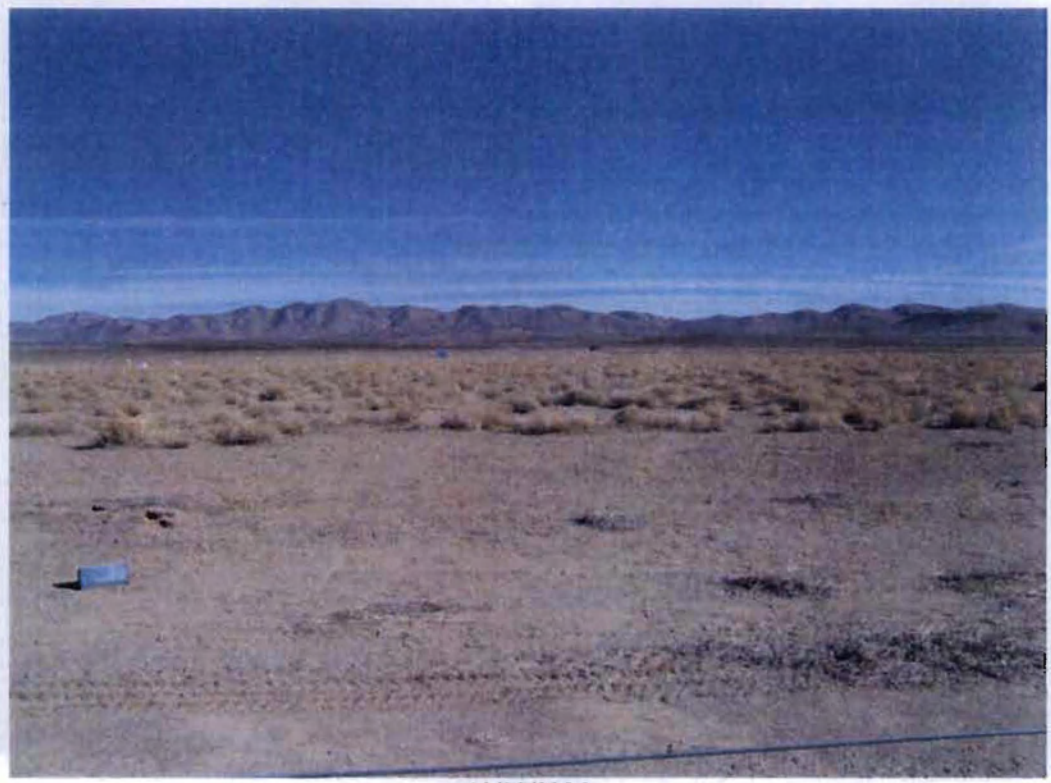
14. View from center of Area 3 WMD U-3ax/bl cover looking northwest.



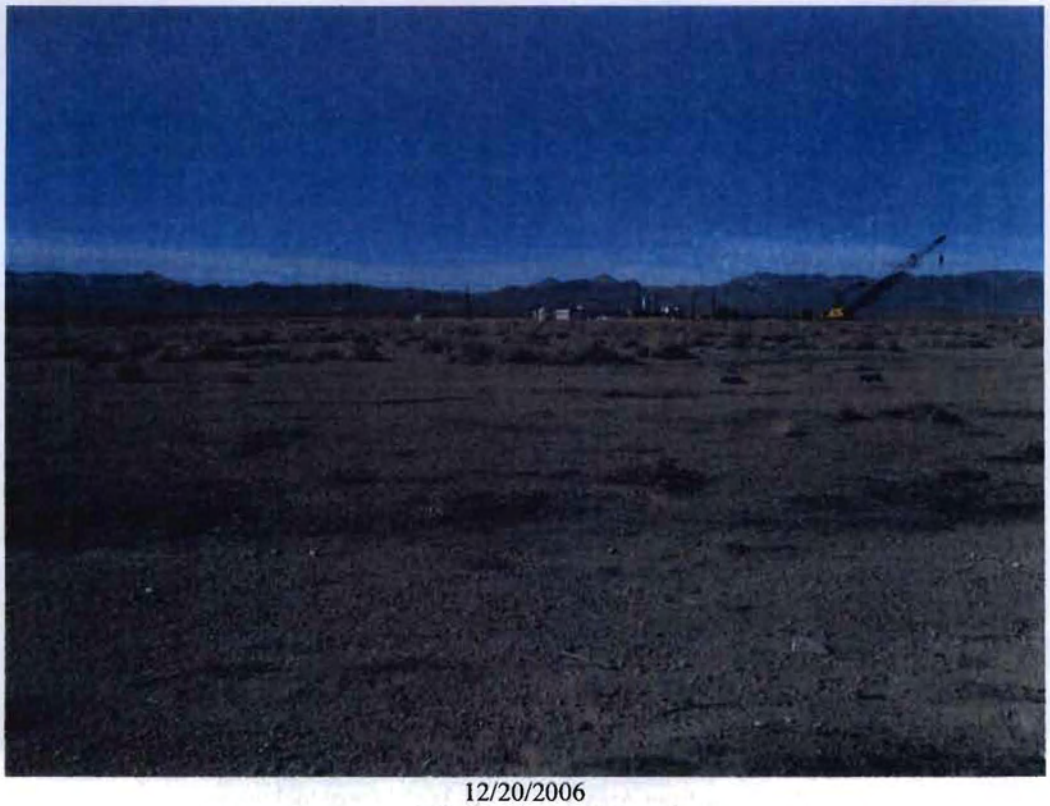
12/20/2006
15. View from center of Area 3 WMD U-3ax/bl cover looking southeast.



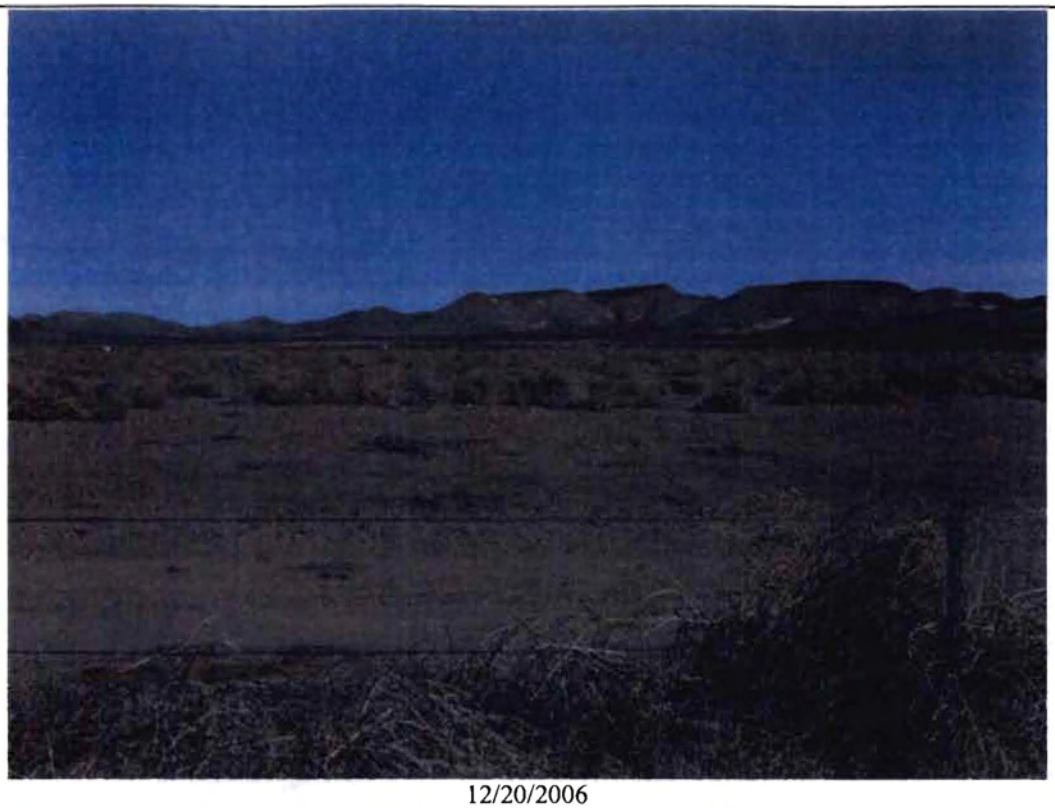
12/20/2006
16. View from center of Area 3 WMD U-3ax/bl cover looking southwest.



12/20/2006
17. View from Area 3 WMD U-3ax/bl fence looking northeast.

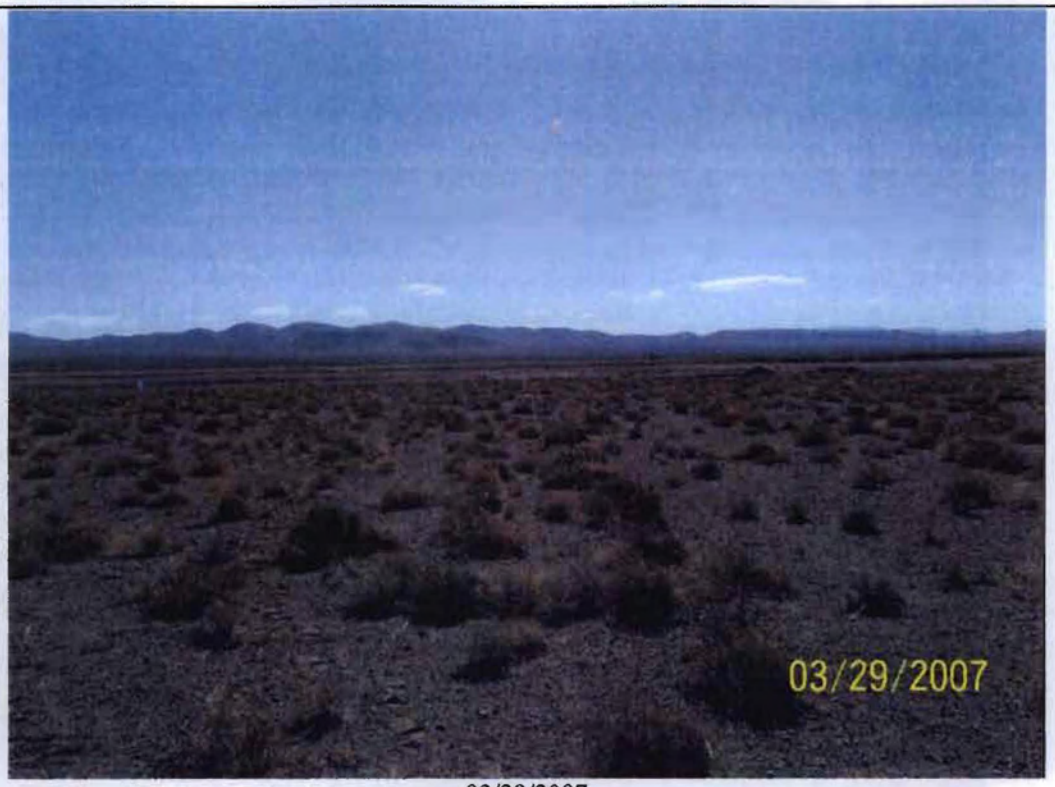


12/20/2006
18. View from Area 3 WMD U-3ax/bl fence looking northwest.



12/20/2006
19. View from Area 3 WMD U-3ax/bl fence looking southeast.

12/20/2006
20. View from Area 3 WMD U-3ax/bl fence looking southwest.



03/29/2007

21. View from center of Area 3 WMD U-3ax/bl cover looking northeast.

03/29/2007

22. View from center of Area 3 WMD U-3ax/bl cover looking northwest.

03/29/2007
23. View from center of Area 3 WMD U-3ax/bl cover looking southeast.

03/29/2007
24. View from center of Area 3 WMD U-3ax/bl cover looking southwest.

03/29/2007
25. View from Area 3 WMD U-3ax/bl fence looking northeast.

03/29/2007
26. View from Area 3 WMD U-3ax/bl fence looking northwest.

03/29/2007
27. View from Area 3 WMD U-3ax/bl fence looking southeast.

03/29/2007
28. View from Area 3 WMD U-3ax/bl fence looking southwest.

05/14/2007

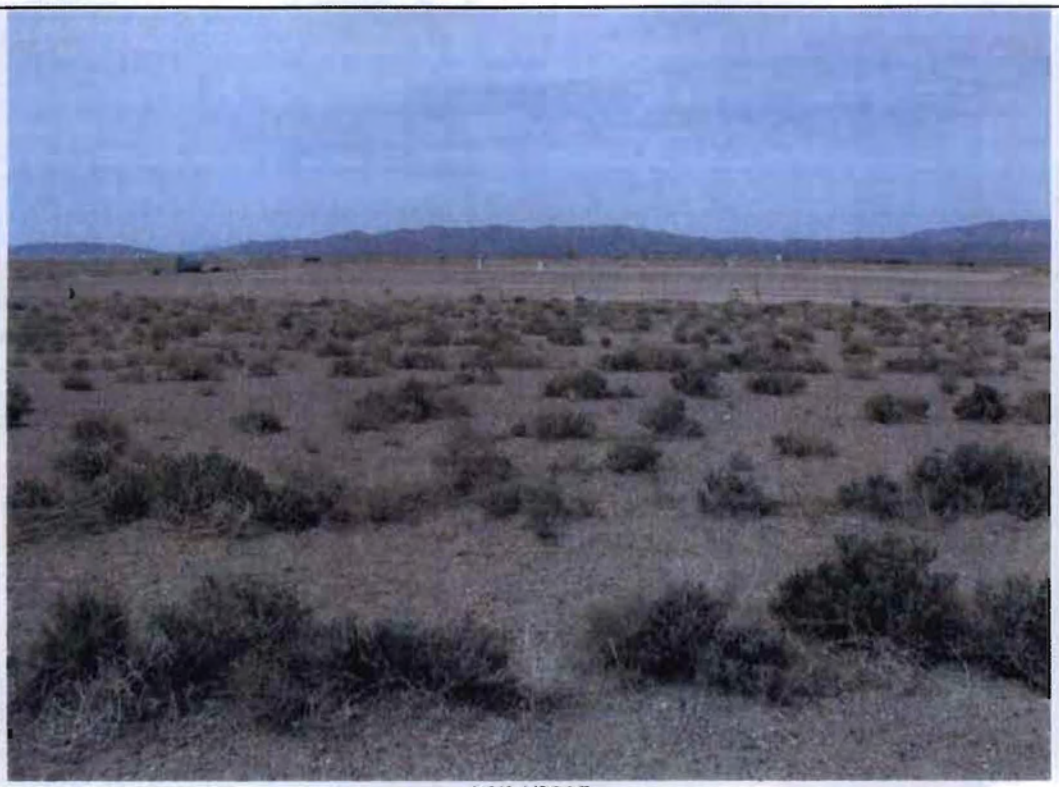
29. View of subsidence on the northeast edge of the Area 3 WMD U-3ax/bl cover.

05/14/2007

30. View of repairs of the northeast edge of the Area 3 WMD U-3ax/bl cover.

06/04/2007
31. View from center Area 3 WMD U-3ax/bl Crater cover looking north.

06/04/2007
32. View from center Area 3 WMD U-3ax/bl Crater cover looking east.

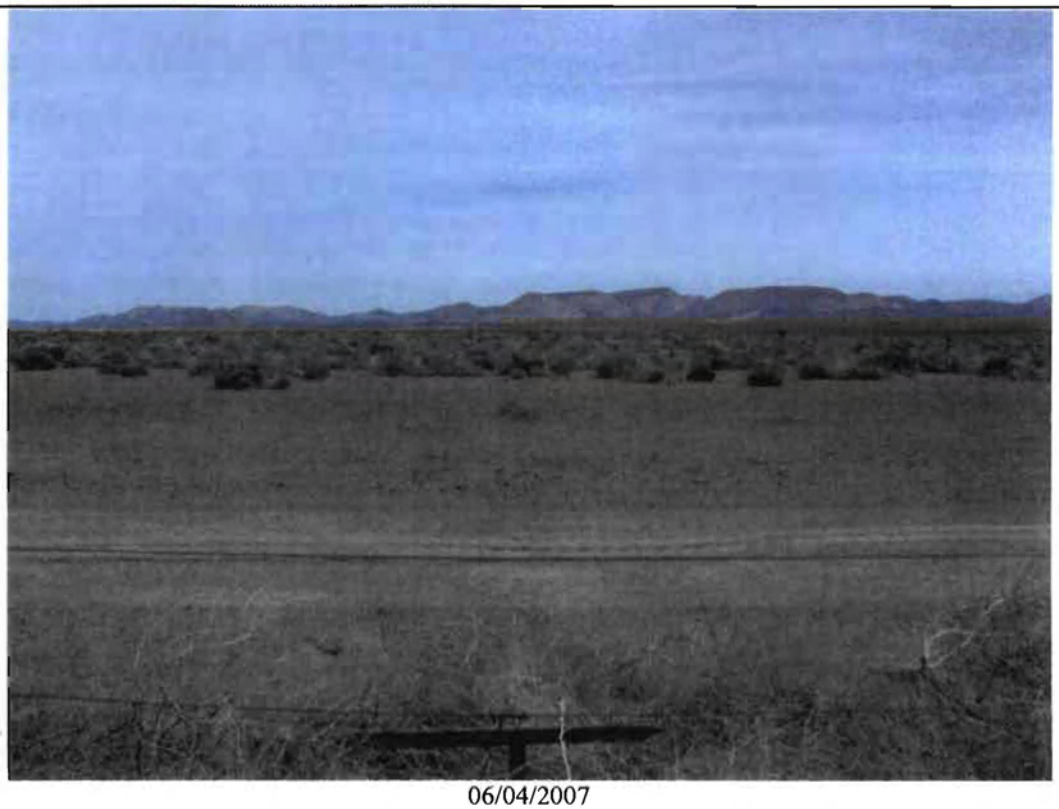


06/04/2007

33. View from center Area 3 WMD U-3ax/bl Crater cover looking south.

06/04/2007

34. View from center Area 3 WMD U-3ax/bl Crater cover looking west.



06/04/2007
35. View from Area 3 WMD U-3ax/bl fence looking north.

06/04/2007
36. View from Area 3 WMD U-3ax/bl fence looking east.

06/04/2007
37. View from Area 3 WMD U-3ax/bl fence looking west.

06/04/2007
38. View from Area 3 WMD U-3ax/bl fence looking south.

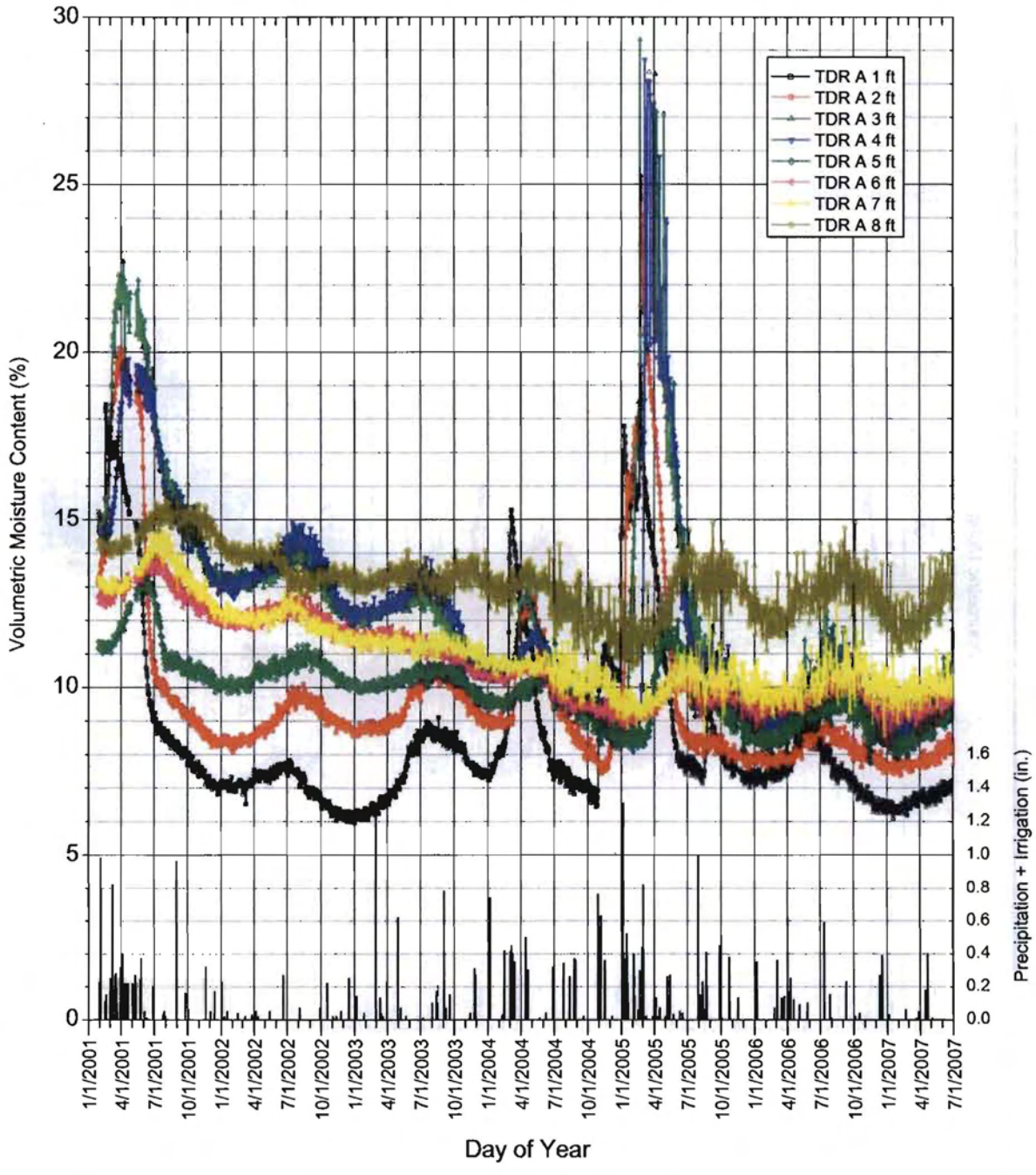
THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B

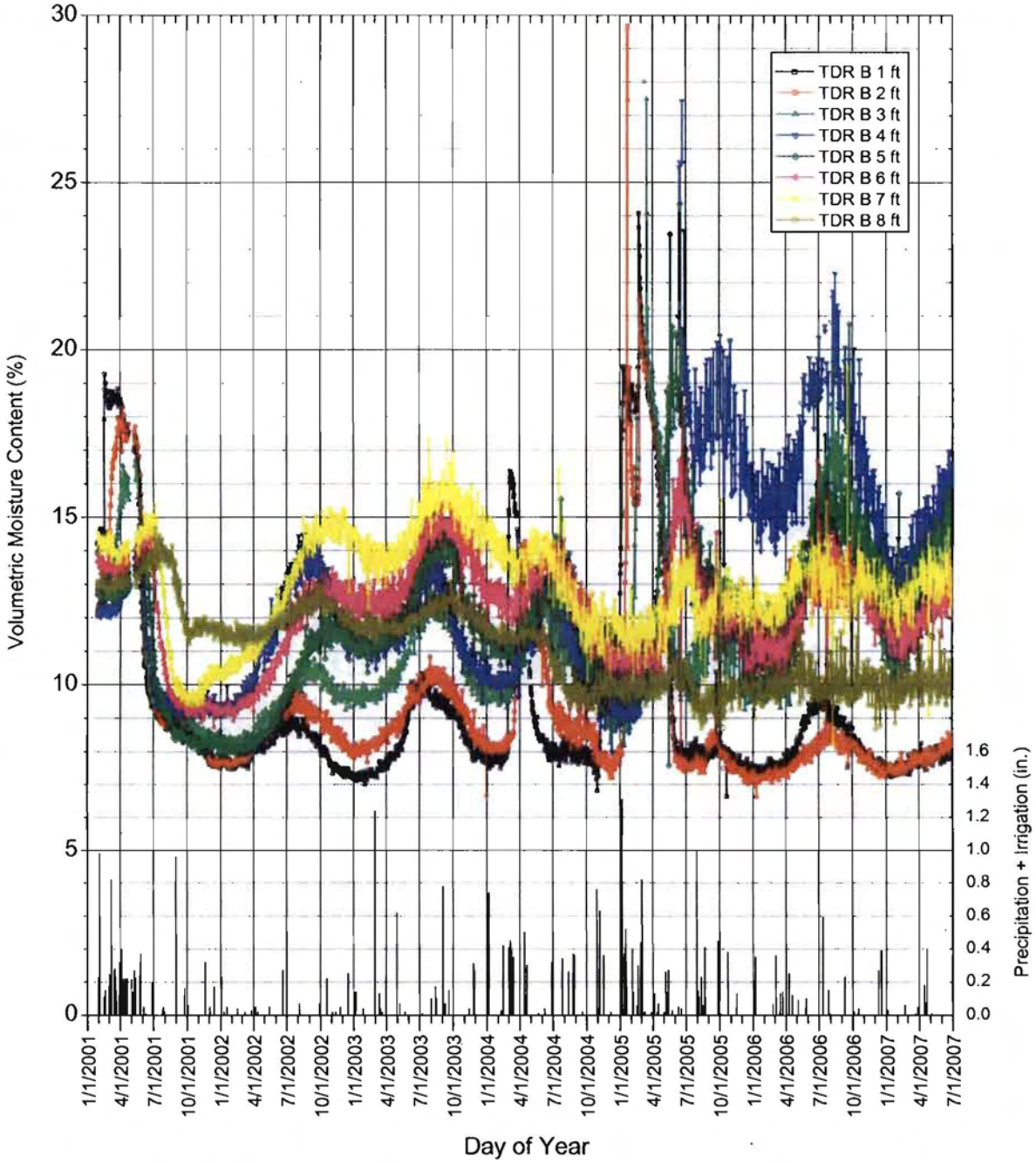
MONITORING DATA*

*Monitoring data is summarized in Section 4.0 of this report, and the complete data set is kept in the project files in Mercury, NV.

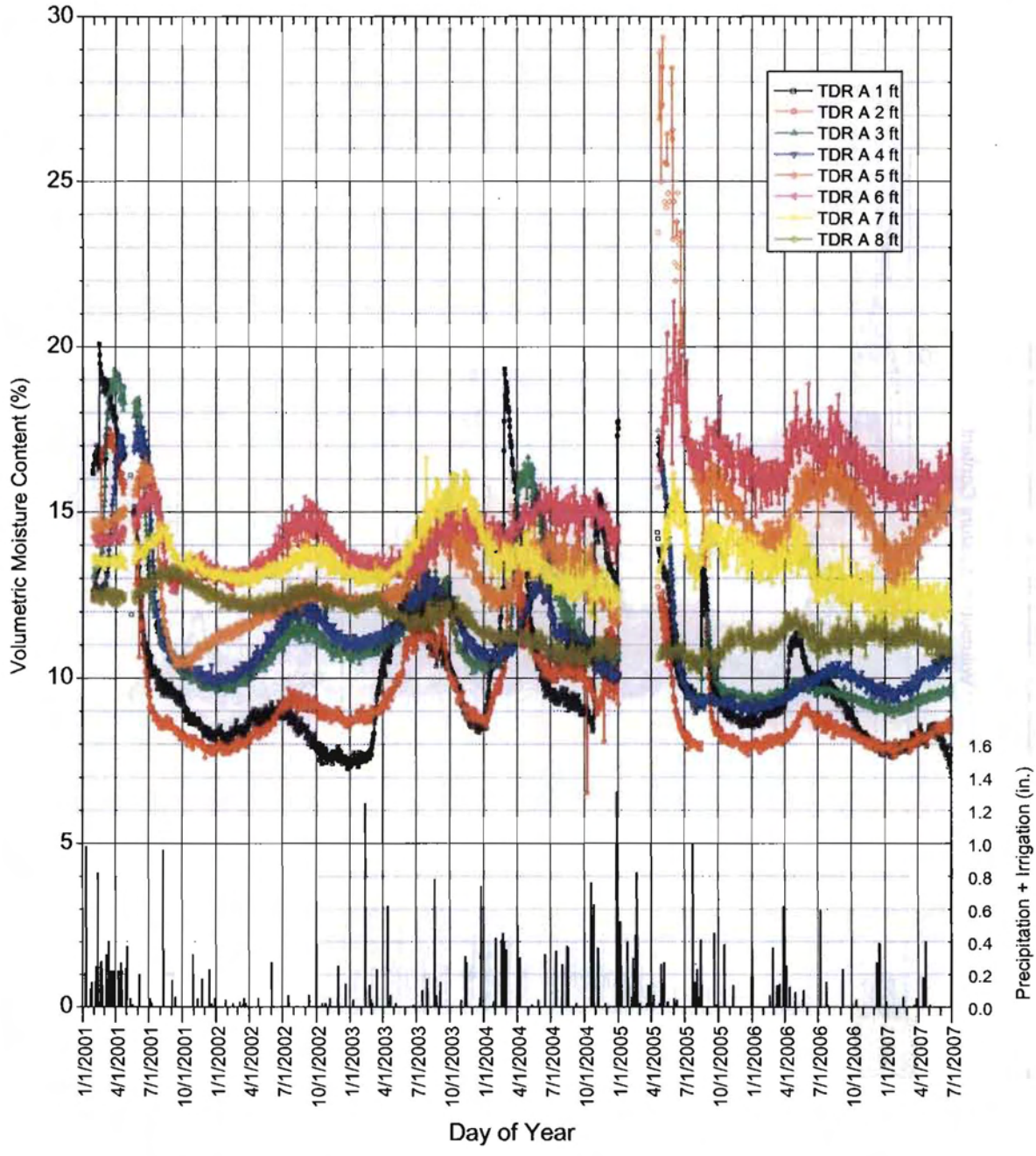
THIS PAGE INTENTIONALLY LEFT BLANK



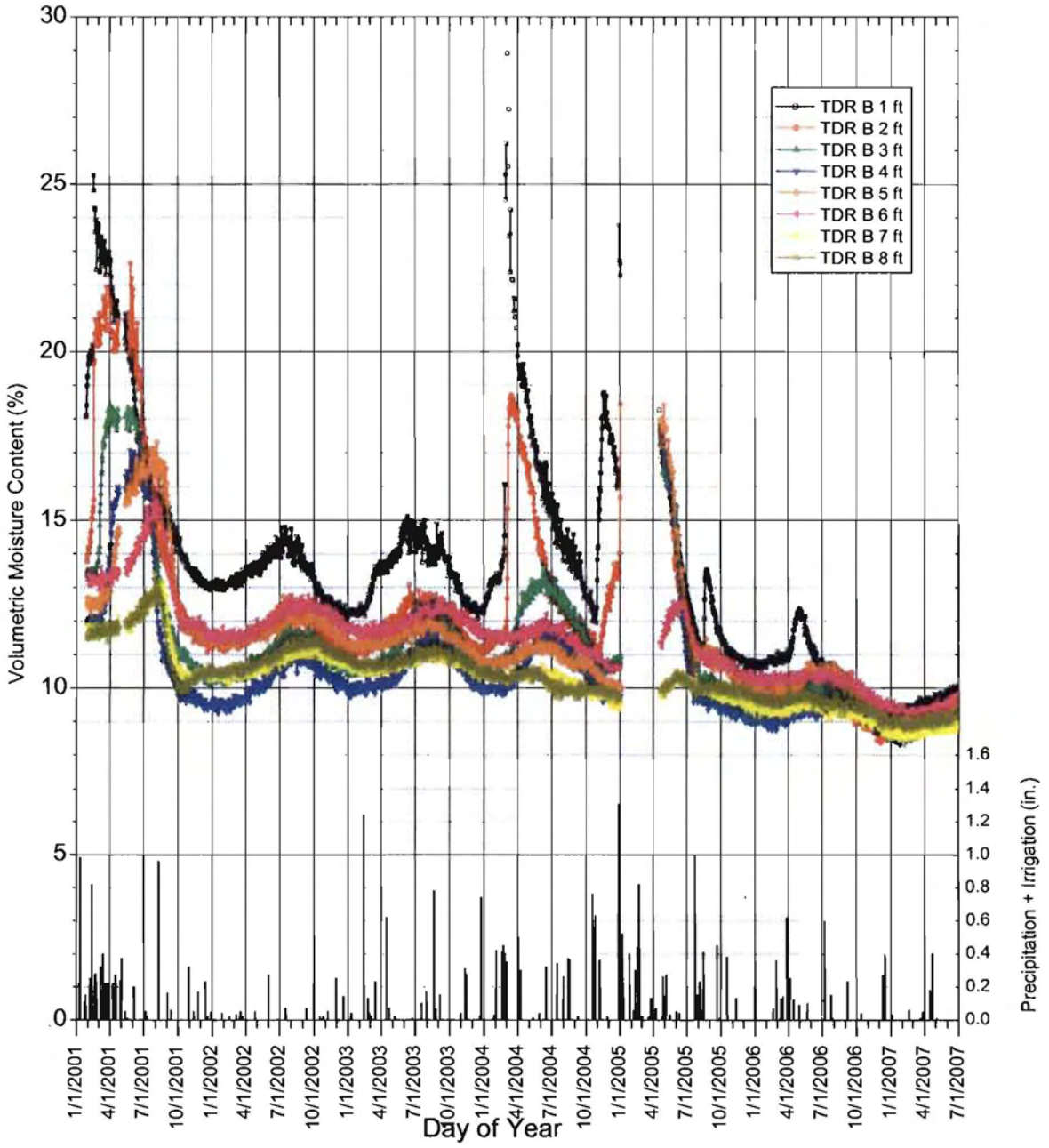
EAST TDR NEST A SOIL MOISTURE CONTENT



EAST TDR NEST B SOIL MOISTURE CONTENT



WEST TDR NEST A SOIL MOISTURE CONTENT

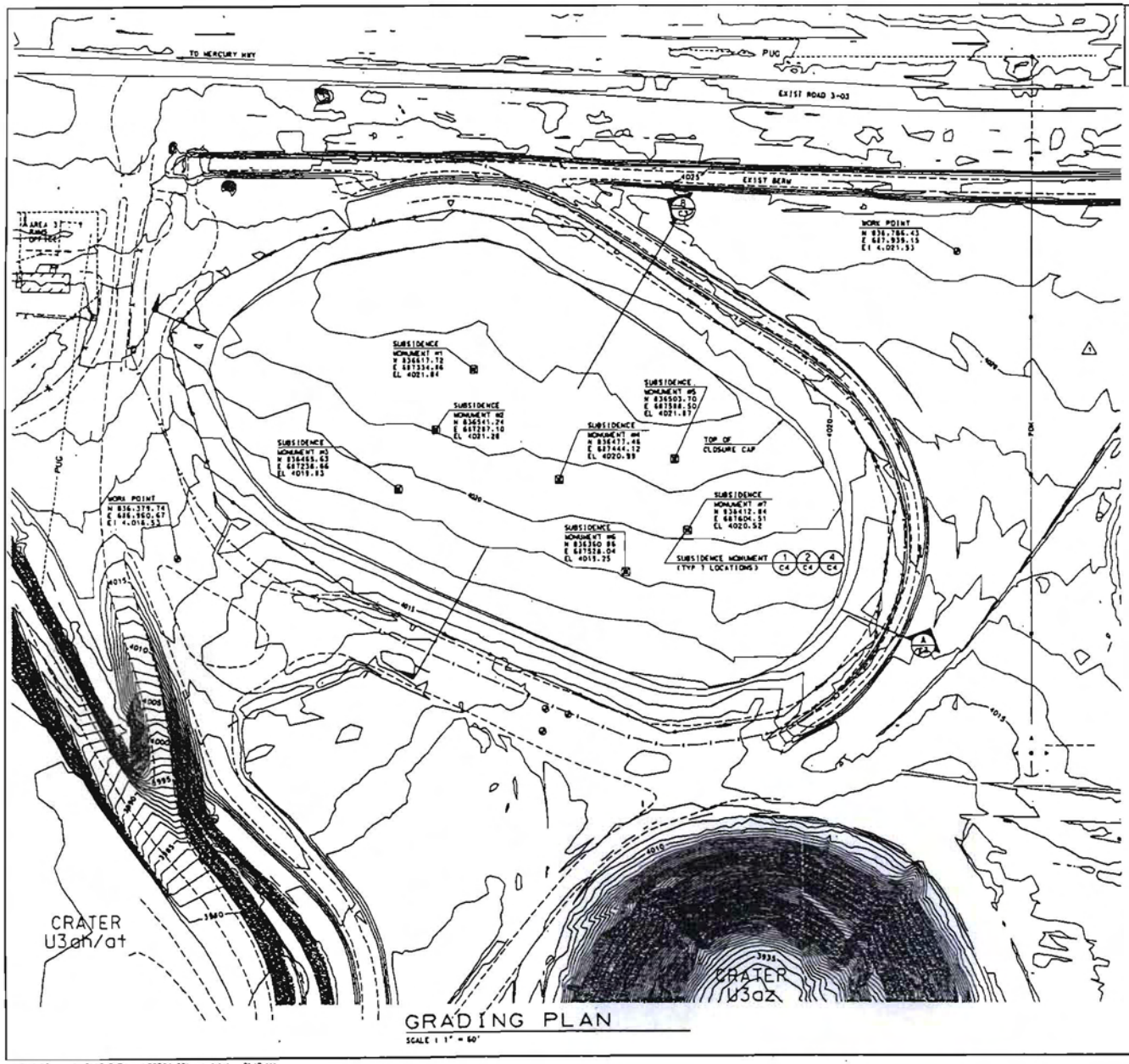


WEST TDR NEST B SOIL MOISTURE CONTENT

APPENDIX C

SUBSIDENCE SURVEY PLATS

THIS PAGE INTENTIONALLY LEFT BLANK



DUAL ENGLISH/METRIC DRAWING

ALL METRIC DIMENSIONS AND NOTATIONS ARE SHOWN BELOW THE DIMENSION LINE OR IN PARENTHESIS.

WHOLE NUMBERS INDICATE MILLIMETERS
DECIMAL NUMBERS SHOWN TO TWO (2) PLACES INDICATE METERS
DECIMAL NUMBERS SHOWN TO THREE (3) PLACES INDICATE KILOMETERS

GENERAL NOTES

1. NATIVE MATERIAL SOILS WERE OBTAINED FROM THE AREA 3 BORROW PIT LOCATED 1.5 MILES (2.41 KM) SOUTH OF THE RWMS.
2. ALL SIDE SLOPES OF THE CLOSURE CAP ARE A MAXIMUM OF 10%(10V:1H).
3. BASIS OF HORIZONTAL CONTROL IS THE NORTH AMERICAN DATUM (NAD) OF 1927, NEVADA STATE PLANE COORDINATES, CENTRAL ZONE, FEET. BASIS OF VERTICAL CONTROL IS THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1929, FEET.

REFERENCES

TITLE SHEET	JS-003-00004-T1
SECTIONS	JS-003-00004-C3
DETAILS	JS-003-00004-C4

ORIGINAL MYLARS SIGNED BY:

AS-BUILT

Bechtel Nevada

ORIGINAL AS-BUILT SIGNED BY:

UNLESS NOTED BY MARKED CHANGES, ALL DIMENSIONS, NOTES, REFERENCES AND CONSTRUCTION FEATURES ARE CORRECTED, AND WERE CONSTRUCTED AS SHOWN ON THIS DRAWING.

GRAPHIC SCALE
0 30 60 120 180 FEET
1" = 60'

CONTOUR INTERVAL = 5 FT

REV	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CONSTRUCTION E/A 700	8/1/00	
1	INCORPORATED DCN JS-003-00004-CO2, 003-001-001-DATED 8/27/2002 AS-BUILT, DATED 03/29/01, REVISED AND ISSUED	8/1/00	

DRAWN AJC 8/7/00
CHECKED AL C. L. LINER 8/7/00
DESIGNED JAS STEVE NACHT 8/1/00
ENGINEER N/A SABINE CURTIS 8/1/00
PROJECT MANAGER N/A
PROJECT NUMBER 00004-1401
CONTRACT NUMBER DE-AC08-96NV11718

U.S. DEPARTMENT OF ENERGY

NEVADA TEST SITE — AREA 03
RADIOACTIVE WASTE MANAGEMENT SITE
CAU 110 U3ax/bl RCRA EQUIVALENT CLOSURE

GRADING PLAN

Bechtel Nevada

DRAWING NUMBER JS-003-00004-C2
SHEET 1 OF REV 1

07/16/03 04:31:27 PM C:\dgn\00004s03\cad_data\c2.dgn

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D

VEGETATION MONITORING REPORT

THIS PAGE INTENTIONALLY LEFT BLANK

VEGETATION MONITORING
CAU 110, U3-ax/bl CLOSURE COVER
May 2007

INTRODUCTION AND BACKGROUND

A closure cover for the U3-ax/bl disposal unit in Area 3 of the Nevada Test Site (NTS) was approved and constructed in the fall of 2000. Immediately after the construction of the closure cover, actions were taken to reestablish a cover of native vegetation. The surface of the completed closure cover was ripped to about 15 centimeters (cm) (6 inches [in.]) and disked to provide a suitable seedbed. A seed mix consisting of nine native shrub species, two native grasses and one native forb was used to seed the surface soils using a Tye drill seeder equipped with multiple drag chains. All plant species included in the seed mix are typically shallow rooted plants. A straw mulch was applied and secured using a Finn crimper. The slopes of the closure cover and the area between the cover and fence were not seeded. All revegetation activities were completed by the end of December 2000. The success of the revegetation effort has been monitored annually since the spring of 2001.

Natural precipitation in this region is unpredictable and meager. To minimize the effects of typical dry conditions and to maximize the potential for seed germination and plant establishment a solid-set irrigation system consisting of a 10-cm (4-in.) pipe feeding 21 lateral lines and 207 super stand sprinklers was assembled and deployed in late December 2000. The first irrigation was in the latter part of January 2001 and the last was the first week of June 2001. The combination of natural precipitation and supplemental irrigation totaled 21.6 cm (8.5 in.), which is 12.6 cm (5.0 in.) more than the 45-year average precipitation received from January to June for this area.

Based on precipitation records from 1961 to 2007, precipitation received during the growing season, which is defined as the period from September of the previous year through June of the current year, have not been favorable for plant growth since revegetation occurred in 2000. The 45-year average amount of precipitation received during the growing season as recorded at the BJY weather station just north and west of the U3-ax/bl closure cover, is 13.2 cm (5.2 in.). In 2001 10.9 cm (4.3 in.) of precipitation were received, slightly below the average. In 2002, 4.1 cm (1.6 in.) were received, and in 2003, 8.6 cm (3.4 in)., completing the third consecutive year with below normal precipitation. Few significant precipitation events occurred from 2001 to 2003. Storms were typically small and failed to provide sufficient moisture for either seed germination or sustained plant growth. Finally in 2004 and 2005, above normal precipitation was experienced: 14.7 cm (5.8 in.) in 2004 and 25.4 cm (10.0 in.) in 2005. During the last two years precipitation during the growing season has been below normal. In 2006 precipitation was 11.2 cm (4.4 in.) and for 2007, through May 6, precipitation is 2.8 cm (1.1 in.).

In 2005 an increase in the number of small mammals on the closure cover was noted, and because of the potential effect of small mammal burrows on the soil water holding capacity and the rate of water infiltration (Arthur and Markham, 1983; Laundr,e 1989, 1993; Smith et al., 1995), action was taken to reduce the number of small mammals on the closure cover and adjacent area between the closure cover and fence. Trapping is typically scheduled for the spring

to remove pregnant animals prior to their first litter of the year. Subsequent trapping sessions may occur later in the summer and fall to remove animals that may have evaded the spring trapping or may have migrated onto the site.

OBJECTIVES

The objective of this report is to present the results of the vegetation monitoring conducted in May 2007. The status of the vegetation on the closure cover is described and herein compared with adjacent areas not revegetated as well as with the vegetation common in similar habitat types. Any problems are identified and remedial actions recommended in order to maintain a viable vegetative cover on the U3-ax/bl closure cover. The results of the small mammal trapping and relocation effort are also presented in this report. The number of captures by species is reported for the one trapping session conducted so far this year.

METHODS

Vegetation Monitoring

The success of the revegetation efforts at the U3-ax/bl closure cover is determined by estimating plant cover, density and diversity data and comparing it to non-seeded areas or to similar vegetation types on NTS. Field sampling this year was completed on May 7, 2007. Five of the fifteen 100-meter (m) (328-foot [ft]) long permanent transects were randomly selected for sampling this year (transect numbers 2, 6, 7, 8, and 14). Three of the five 50-m (164-ft) permanent transects located between the closure cover and the perimeter fence, a non-seeded area, are typically sampled and compared to the seeded area. In 2007 the non-seeded area was not sampled because, like last year, there was no vegetation. Data gathered last year will be used for comparisons.

Plant cover is estimated using an ocular projection device that is placed at a given interval along each transect. At each placement four ocular points are projected, and the type of cover, e.g. rock, bare ground, litter, mulch, or plant species, intercepted by the points is recorded. A total of 100 points are sampled per transect on the closure cover and 50 points along each of the transects sampled in the non-seeded area. Absolute cover is determined by dividing the number of points recorded for each cover class or species by the total number of points projected.

Plant density is estimated using a meter square (m^2) quadrat, which is placed at given intervals along each transect. At each location the number of individual plants encountered within each quadrat is counted and recorded. Twenty quadrats are placed at 5-m (16.4 -feet [ft]) intervals along the transects located on the closure cover and 10 quadrats at 5-m (16.4 -ft) intervals along transects located on the unseeded area. Plants density estimates are averaged over all quadrats and reported as number of plants per unit area (m^2).

Plant diversity is a measurement of the number of different species found on a site. Plant diversity is determined by counting and recording the number of species found within each

quadrat used to sample plant density. The numbers are averaged and reported as the number of species per area.

To assess the revegetation success of a site, comparisons can be made to undisturbed habitat in similar vegetation types. However, there are no sites within close proximity of the U3-ax/bl closure cover that have not been disturbed. The only possible reference data is from permanent study plots established on NTS in the 1960s (Webb et al., 2003) to monitor vegetation changes. One of the permanent plots is located near the U3-ax/bl closure cover in a shadscale/winterfat plant assemblage (Webb et al., 2003), which is similar to the type of vegetation that has established on the closure cover. This permanent study plot was visited in 2002 to be sampled but was found to be heavily disturbed and was not sampled. Data collected in 1963 and 1975, prior to being disturbed, showed a total vegetative cover of 16.4% and 25.8%, respectively. The fluctuations in plant cover could have been the direct result of the amount of precipitation received during the growing season, which was 7.9 cm (3.1 in.) in 1963, well below the normal of 13.2 cm (5.2 in.) and 29.2 cm (11.5 in.) in 1975, almost twice the average.

Small Mammal Relocation

In the spring of 2007 small mammal traps with trap covers were placed near active small mammal burrows on the closure cover and along the perimeter fence. Approximately 100 small mammal traps were placed near active burrows on and around the closure cover in the spring of 2005. Another 30 traps were added during the spring 2007 trapping session. Several traps were repositioned based on burrow activity and capture results. A single trapping session, consisting of three trap-nights, occurred the first week of May. The goal was to remove sufficient number of animals so that total captures are 10 or less during one trap night. During each trapping session, traps are opened in the evening at a time when diurnal animals (ground squirrels, birds, etc.) are least likely to be active and enter the traps. Traps are baited with a mix of bird seed and rolled oats. Captured animals are removed from the traps early enough the next morning to minimize stress to the captured animals. Animals are removed from the traps, and descriptive information is recorded on each animal before it is released. Information recorded may include the species of the captured animal, its sex, reproductive status, vigor, age class, or weight. The animals are transported to an area of similar habitat and at a distance beyond their home range (Howard 1995). At this distance released animals are unlikely to return to the U3-ax/bl closure cover. Relocation sites are typically 3 to 8 kilometers (km) (5 mi) from the U3-ax/bl closure cover.

RESULTS

Vegetation Monitoring

Plant Cover – Perennial plant cover was 10.6% in 2007, a significant decrease from the 19.6% experienced last year, yet still higher than it was in 2004 (Table 1). The only plant contributing to plant cover this year was shadscale. In previous years other common shrubs, such as Nevada ephedra and winterfat, contributed to overall plant cover (Table 1). Grasses have never established well on the cover cap and have never contributed to overall perennial plant cover (Figure 1). This year, like last year, there were no annual plants. Precipitation has been below recorded,

Table 1. Average percentage plant cover on the closure cover at CAU 110, U3-ax/bl from 2001 to 2007.

Perennials	2001	2002	2003	2004	2005	2006	2007	Unseeded
Shadscale**	-*	-*	2.2	8.6	15.4	18.0	10.6	0.0
Nevada Ephedra	-*	-*	0.0	0.4	0.8	1.2	0.0	0.0
Winterfat	-*	-*	0.2	0.6	0.4	0.4	0.0	0.0
Fourwing saltbush	-*	-*	0.0	0.0	0.2	0.0	0.0	0.0
Total Perennial Plant Cover	2.6	6.4	2.4	9.6	16.8	19.6	10.6	0.0
Annuals								
Buckwheat	-*	-*	0.6	0.2	1.2	0.0	0.0	0.0
Halogeton	-*	-*	0.0	0.0	0.0	0.0	0.0	0.0
Russian thistle	-*	-*	0.0	3.0	1.2	0.0	0.0	0.0
Other annual forbs	-*	-*	0.2	0.0	0.8	0.0	0.0	0.0
Cheatgrass	-*	-*	0.0	0.0	0.2	0.0	0.0	0.0
Total Annual Plant Cover	5.2	0.0	0.8	3.2	3.4	0.0	0.0	0.0
Total Plant Cover	7.8	6.4	3.2	12.8	20.2	19.6	10.6	0.0
Bare Ground/Rock	48.6	69.5	68.8	72.6	53.6	57.2	63.6	58.7
Litter/Mulch	43.6	24.1	28.0	14.6	26.2	23.2	25.8	41.3

* - Not recorded by species
** - See Table 4 for scientific names

normal the last two years. Since September of 2006 only 2.5 cm (1.0 in.) of rain has been obviously insufficient for any annual growth and even detrimental to perennial plant growth and vigor.

With the lack of precipitation, noxious annual plants, such as Russian thistle and halogeton, have not been present in either the seeded or non-seeded areas. As mentioned in previous years, reseeding the closure cover with perennial native plant species, followed by a short-term intensive irrigation, has resulted in a viable perennial plant cover somewhat resistant to typical drought conditions, thus providing a persistent vegetative cover, even during below normal precipitation periods. Without such a persistent perennial plant cover, active evapotranspiration would be dependent on annual plant growth, which, as noted in the last five years, is limited in time and duration. Annual plants are non-existent during severe or continuous periods of drought; even during favorable growing conditions, their short lifespan (weeks) limits their contribution to evapotranspiration.

The amount of exposed soil as measured by the percentage of bare ground has averaged a little more than 60% over the last four years (Table 1), not much different than the amount of bare ground on the non-seeded areas. The amount of litter on the closure cover averages 22%, notably lower than the 41% on the non-seeded areas.

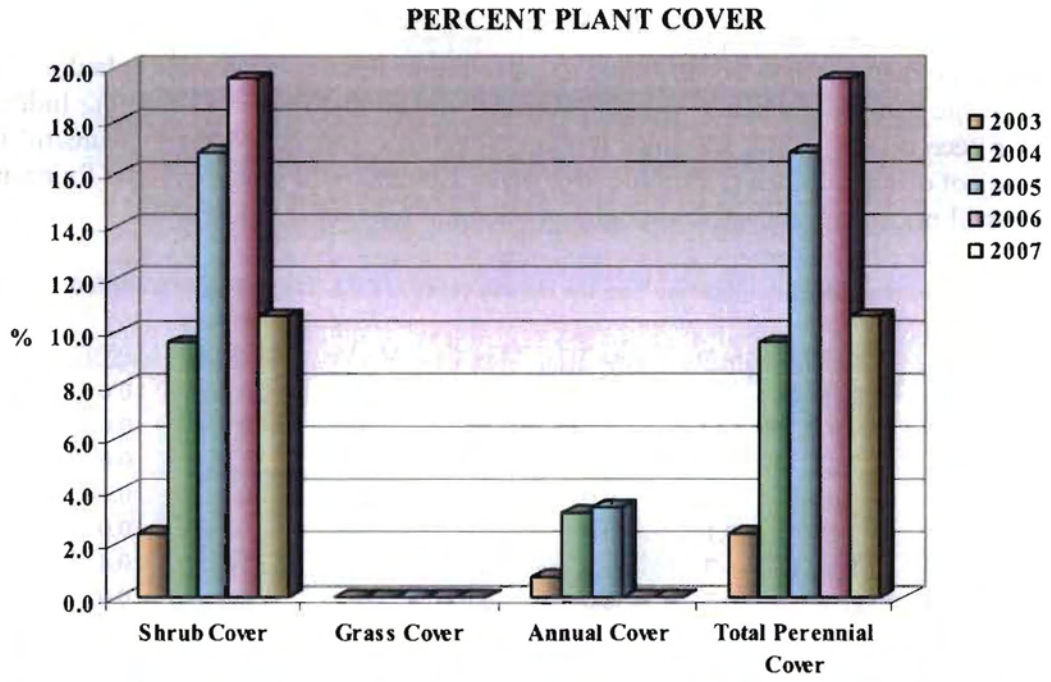


Figure 1. Changes in plant cover on the closure cover at U3-ax/bl over the last five years.

In comparison to historic data collected from the permanent study plots (Webb et al., 2003), the amount of vegetative cover experienced this year is lower than would be expected on native, undisturbed vegetation. Composition of the vegetative cover on the closure cover is different than was recorded on the permanent study plot. Bud sagebrush, spiny hopsage, and wolfberry are common in the native plant community, but they have not established on the closure cover. These species were included in the mix of seeds used to revegetate the site knowing that they are typically very difficult to establish from seed. Previously a few individual plants of bud sagebrush and spiny hopsage have been observed on the site, but neither species is present in sufficient numbers to contribute to overall vegetative cover.

The other difference between the U3-ax/bl closure cover and the ecological monitoring plot is in the amount of perennial grasses. Grasses have not contributed to plant cover on the closure cover to date. On the ecological monitoring plot, grasses made up less than 1% in 1963 but increased to 2.5% in 1973. Grasses contribute a small amount to overall plant cover in this vegetation type; however, it should be more than is currently measured on the closure cover. Indian ricegrass and squirreltail grass are present on the closure cover and, with time and more favorable growing conditions, may contribute more to total plant cover.

Plant Density – The 2.0 perennial plant species/m^2 represents the lowest density measured on the closure cover to date (Table 2; Figure 2). The decrease cannot be attributed to a single species, rather the decrease can be attributed to a decline in shadscale, Nevada ephedra, winterfat, and the complete absence of both perennial and annual grasses (Table 2). Indian ricegrass has been present at the site since it was revegetated; it declined to 0.1 plants/m^2 last year and was not observed during sampling this year. Several individual plants of fourwing saltbush are still present on the site although not encountered on the study plots.

Table 2. Summary of plant density (plants/m^2) on the closure cover at CAU 110, U3-ax/bl from 2001 to 2007.

Shrubs	June '01	Apr '02	June '03	May '04	May '05	May '06	May '07	Unseeded
Mohave Buckwheat	11.3	4.2	0.0	0.0	0.0	0.0	0.0	0.0
Budsage	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burrobush	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Desert Thorn	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fourwing Saltbush*	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Nevada Ephedra	6.8	6.7	1.3	1.5	1.8	1.3	0.4	0.0
Rubber Rabbitbrush	11.2	0.7	0.0	0.0	0.0	0.0	0.0	0.0
Shadscale	13.4	10.3	2.7	2.3	2.5	1.9	1.4	0.0
Spiny Hopsage	1.9	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Winterfat	0.3	2.7	0.4	0.7	0.4	0.3	0.2	0.0
Grasses								
Indian Ricegrass	5.8	1.3	0.3	0.4	0.3	0.1	0.0	0.0
Squirreltail	3.3	0.2	0.0	0.0	0.1	0.0	0.0	0.0
Annual grasses	0.0	0.0	0.1	0.5	1.9	1.2	0.0	0.0
Forbs								
Globemallow	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Buckwheat	-	-	15.1	7.8	13.7	0.2	0.0	0.0
Halogeton	-	-	0.2	3.9	12.5	0.0	0.0	0.0
Russian thistle	-	-	3.4	77.0	70.3	3.2	0.0	0.0
Other annual forbs	-	-	0.8	0.4	2.0	0.1	0.0	0.0
Shrubs	56.3	24.8	4.5	4.5	4.7	3.5	2.0	0.0
Grasses	9.1	1.5	0.4	0.9	2.3	1.3	0.0	0.0
Forbs	0.0	0.0	19.5	89.1	98.5	3.5	0.0	0.0
Total Plant Density	65.4	26.3	24.4	94.5	105.5	8.3	2.0	0.0

* Not Seeded
See Table 4 for scientific names

The decrease in plant density may be the result of above normal precipitation in 2005 and part of 2006, resulting in increases in plant biomass, at least during 2005. In response to the increase in the food supply, the small mammal population increased dramatically as was evident from the small mammal trapping and relocation efforts in 2006 (Table 3). At the same time a marked increase in the number of lagomorphs (rabbits) took place on much of NTS. The severe drought

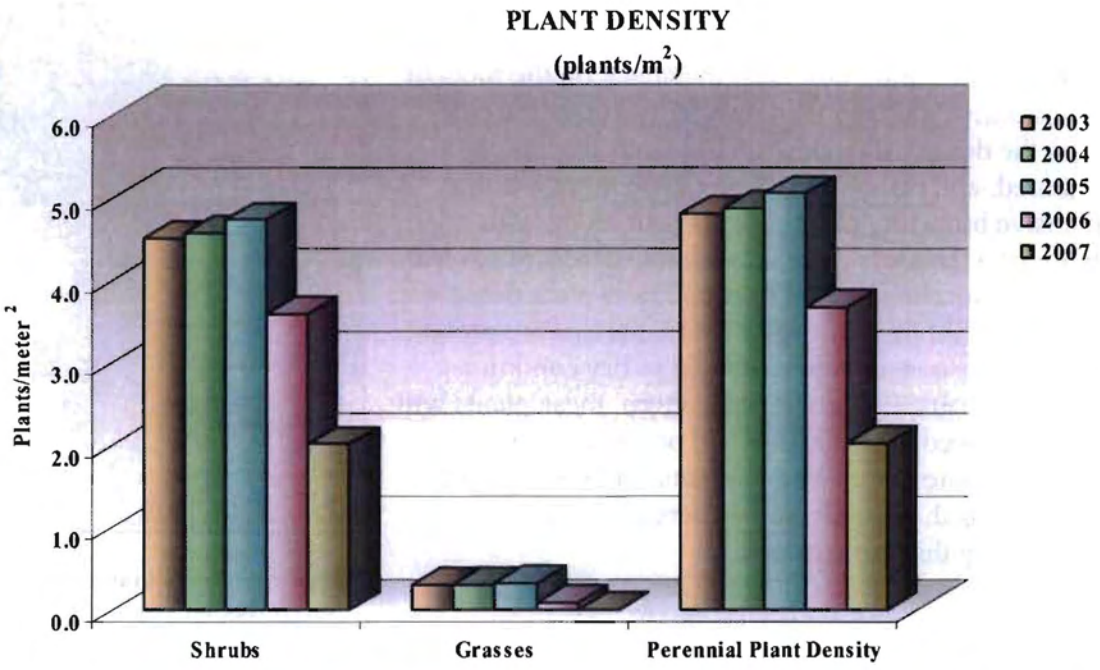


Figure 2. Changes in plant density on the closure cover at U3-ax/bl over the last five years.

conditions the last couple years have left these two groups of animals without sufficient food. It was evident during the vegetation sampling session this year that many plants are being grazed to a point where they may not recover. The most common plant experiencing heavy utilization is winterfat (Figure 3). It is more palatable than shadscale or Nevada ephedra and is preferred by browsing animals. Shadscale also showed signs of heavy browsing (Figure 4). This is quite uncommon because this species is not commonly browsed. The spiny nature of the plant and the high salt content of the leaves make this plant a less desirable plant for browsers. In many instances not only has the above ground biomass been browsed, but animals have burrowed into

Figure 3. Severe browsing of foliage and roots of winterfat.

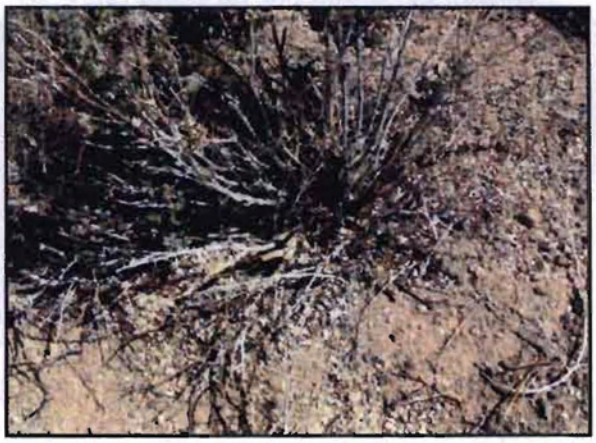


Figure 4. Severe browsing of stems of shadscale.

the roots, in search of moist and more palatable portions of the plant (Figure 5). In most cases plants recover from above ground browsing; however, the attack on the roots of the plant usually results in plant mortality. Over the past few years the density of shadscale has decreased as plants have matured, and resources have become more limiting. The intensive browsing observed this year along with burrowing into the roots coupled with the effects of severe drought conditions may result in even lower plant densities in future years. At the same time the plants that are present are native to the area and have adapted to dry conditions. When favorable growing conditions return, these plants will flower and set seed, like they have in previous years, thus improving the potential of young plants establishing and filling any voids that may have been created from plant mortality during this drought period.

Figure 5. Small mammal burrowing into roots of shadscale.

Plant Diversity – Plant diversity, as measured by the number of different plant species present at a site, has declined from a high of nine perennial species in 2002 to just three species this year. The three species were shadscale, winterfat, and Nevada ephedra. Last year Indian ricegrass was encountered and the year before spiny hopsage. Decreases in plant diversity is typical of the dry desert climate of NTS. As sufficient precipitation is received for plant growth, not only does plant density increase, but species such as Indian ricegrass, spiny hopsage, and bud sagebrush reappear.

Small Mammal Trapping and Relocation – The 2005 trapping effort consisted of six trap nights, three per week for two consecutive weeks in April, and then three trap nights in both June and September for a total of 12 trap nights. A total of 186 animals were removed from the closure cover and relocated approximately 8 km (5 mi.) from the site. Trapping in 2006 began the week of April 17 and continued through the week of May 8, for a total of 12 trap nights. A total of 449 animals were captured and relocated during the four weeks, which is more than twice as many animals relocated in 2005. Relocation efforts in 2007 included three trap nights during the week of April 23. A total of 46 animals were captured and relocated (Table 3). Of note was the capture and relocation of nine whitetail antelope squirrels. Only one had been captured previously.

Since the spring of 2005, 681 animals have been removed from the CAU 110, U3-ax/bl closure cover area, 341 from the closure cover and 340 from the area between the closure cover and the fence. Kangaroo rats, primarily Merriam's and some Great Basin, are the most common group of small mammals captured (58% of all captures). Over all sessions 396 kangaroo rats were captured and relocated. A total of 272 deer mice were captured (40% of all captures) and relocated. Ten whitetail antelope squirrel, one grasshopper mouse, and two longtailed pocketmice were captured and relocated (2% of all captures) (Table 3).

A casual reconnaissance of the closure cover this year would suggest an increased amount of burrowing activity, although the number of animal captures is contradictive. Closer inspection of the new burrows revealed shallow burrows (Figure 5) apparently constructed in an effort to reach the roots of shadscale and winterfat (Figure 3). In some instances the burrow would circle a shrub but would not penetrate more than 8 - 12 cm (3 - 5 in).

As previously reported the exclusion of small mammals from the closure cover would require a significant effort. Basic attempts to exclude burrowing animals from the site, such as increasing predators or animal relocations, appear to be inconsequential in comparison to the fluctuations in the number of small mammal caused by increases or decreases in annual precipitation and plant production.

Table 3. Results of trapping and relocation of small mammals on the closure cover and surrounding area within the perimeter fence at CAU 110, U3-ax/bl from April 2005 to May 2007.

	2005 & 2006		May '07		Totals Year to Date	
	Cover	Fence	Cover	Fence	Cover	Fence
Merriam's Kangaroo Rat	156	177	20	13	176	190
Great Basin Kangaroo Rat	18	8	3	1	21	9
Whitetail Antelope Squirrel	0	1	3	6	3	7
Longtailed Pocketmouse	2	0	0	0	2	0
Grasshopper Mouse	1	0	0	0	1	0
Deer Mouse	138	134	0	0	138	134
	315	320	26	20	341	340

CONCLUSIONS/RECOMMENDATIONS

The perennial plants found on the closure cover at U3-ax/bl appear to be well established and continue to provide a viable vegetative cover (Figures 6a-6d; 7a-7d). Some species are less tolerant of dry conditions, but with increased precipitation these species seem to recover. There appears to be added stress on the plants from the robust populations of small mammals and lagomorphs the last couple years. There is no indication that remedial revegetation is necessary at this time, but vegetation monitoring in future years should focus on the effects of the increased number of small mammals and lagomorphs recently, specifically on the density and vigor of the perennial plants present on the closure cover. Also it is important to monitor the presence of annual weedy species, such as halogeton, cheatgrass, and Russian thistle. The peripheral area between the cover cap and the fence has become a source of seed for these weedy species. Without a cover of perennial native plants these areas are prone to invasion by annual weedy species, which then can spread onto adjacent areas. Currently these species are in check on the closure cover; however, if they increase in density on the closure cover, some remedial action may be necessary to protect the composition and stability of the vegetative cover on the closure cover. Any significant ground disturbances on the closure cover where the vegetation has been removed or heavily disturbed should be vegetated. Weedy species, such as halogeton or Russian thistle, are poor competitors and it is important to as quickly as possible, establish a vegetative cover comprised of native perennial species. This will minimize the possibility of these areas being dominated by noxious weeds and serving as a source of seed for these species.

There may be some minor tasks that could be done that may reduce the number of small mammals on the closure cover. As noted from the trapping data there are as many small mammals along the fence as there are on the closure cover (Table 3). During periods of abundant precipitation and plant growth skeletons of plants, primarily Russian thistle (tumble weeds) accumulates on both sides of the fence that surrounds the closure cover. These mounds of Russian thistle provide excellent cover for small mammals and protect them from predators. This added cover also serves as an island for animals moving onto the site from adjacent areas. These islands reduce the distance that to which immigrating small mammals are exposed. Removing the Russian thistle from the perimeter of the closure cover would 1) reduce the possibility that animals would inhabit these areas because it would be too open and exposed; 2) expose animals that are there to natural predators, again reducing the likelihood that they (small mammals) would occupy the area; and 3) eliminate islands of protection, and increase the distance an animal is exposed when moving onto the site from adjacent habitats.

Figure 6a. CAU 110, U3-ax/bl closure cover: June 2002, looking southeast from center of cover.

Figure 6b. CAU 110, U3-ax/bl closure cover: June 2005, looking southeast from center of cover.

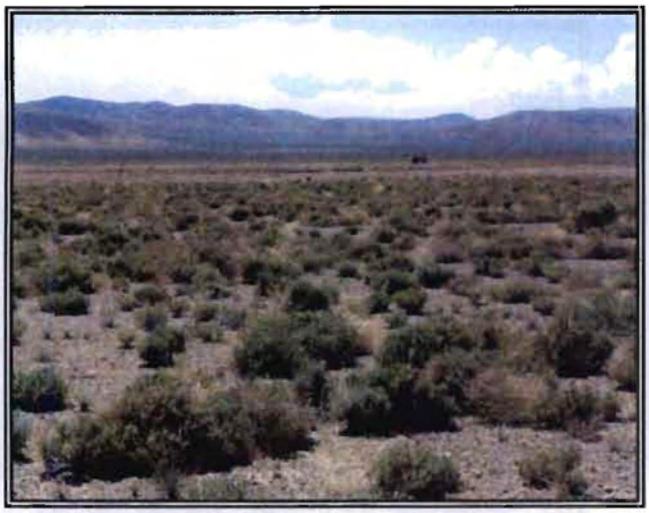


Figure 6c. CAU 110, U3-ax/bl closure cover: May 2006, looking southeast from center of cover.

Figure 6d. CAU 110, U3-ax/bl closure cover: May 2007, looking southeast from center of cover.

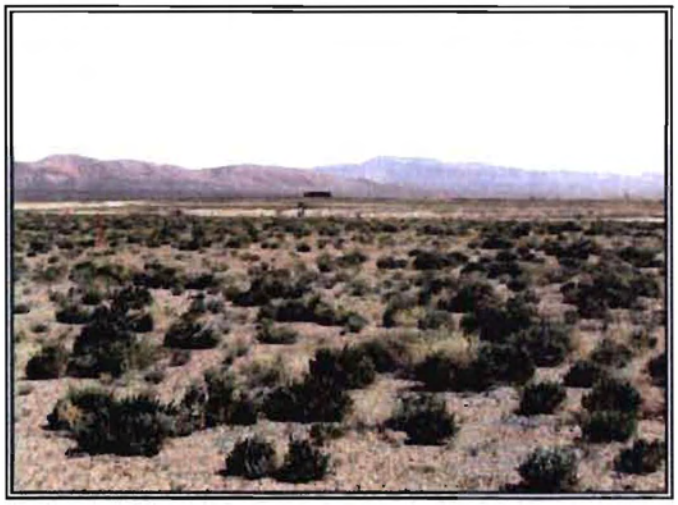


Figure 7a. CAU 110, U3-ax/bl closure cover: May 2004, looking southeast from center of cover

Figure 7b. CAU 110, U3-ax/bl closure cover: June 2005, looking southeast from center of cover.

Figure 7c. CAU 110, U3-ax/bl closure cover: May 2006, looking southeast from center of cover.

Figure 7d. CAU 110, U3-ax/bl closure cover: May 2007, looking southeast from center of cover.

Table 4. Scientific and common names of plant species seeded or encountered on the CAU 110, U3-ax/bl closure cover.

	Scientific Name	Common Name
PERENNIALS		
SHRUBS	*Picrothamnus desertorum*	Bud sagebrush
	Atriplex confertifolia	Shadscale
	Ephedra nevadensis	Nevada ephedra
	Ericameria nauseosa	Rubber rabbitbrush
	Eriognum fasciculatum	Eastern Mohave buckwheat
	Grayia spinosa	Spiny hopsage
	Krascheninnikovia lanata	Winterfat
	Atriplex canescens (not seeded)	Fourwing saltbush
GRASSES	*Achnatherum hymenoides*	Indian ricegrass
	Elymus elymoides	Squirreltail
FORBS	*Sphaeralcea ambigua*	Globemallow
ANNUALS		
GRASSES	*Bromus tectorum*	Cheatgrass
	Schimus arabicus	Arabian schismus
FORBS	*Amsinckia tessellata*	Bristly fiddleneck
	Chaenactis stevioides	Steve's pincushion
	Cryptantha nevadensis	Nevada cateyes
	Descurania pinnata	Pinnate tansymustard
	Eriogonum species	Buckwheat
	Eriogonum nidularium	Birdnest buckwheat
	Halogeton glomerata	Halogeton
	Malacothrix glabrata	Smooth desert dandelion
	Mentzelia species	Blazingstar
	Salsola tragus	Prickly Russian thistle
	Sisymbrium altissimum	Tumblemustard

LITERATURE CITED

Arthur, W. J. and O. D. Markham. 1983. Small mammal soil burrowing as a radionuclide transport vector at a radioactive waste disposal area in southeastern Idaho. *J. of Environmental Quality* 12 (1): 117 - 122.

Howard, V. W., Jr. 1994. Kangaroo rats-Prevention and control of wildlife damage. Cooperative Extension Division, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln. pp. B-101 - B-104.

Laundre, J. W. 1993. Effects of small mammal burrows on water infiltration in a cool desert environment. *Oecologia* 94(1): 43-48.

Laundre, J. W. 1989. Horizontal and vertical diameter of burros of five small mammal species in southeastern Idaho. *Great Basin Naturalist* 49(4): 646-649.

Smith, E. D., R. J. Luxmoore and G. W. Suter, II. 1995. Natural physical and biological processes compromise the long-term performance of compacted soil caps. Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN.

Webb, R. H., M. B. Murov, T. C. Esque, D. E. Boyer, L. A. DeFalco, D.F.Haines, D. Oldershaw, S. J. Scoles, K. A. Thomas, J. B. Blainey and P. A. Medica. 2003. Perennial vegetation data from permanent plots on The Nevada Test Site, Nye County, Nevada. U.S. Geological Survey Open-File Report 03-336. Tucson, AZ.

APPENDIX E

PRECIPITATION RECORDS

THIS PAGE INTENTIONALLY LEFT BLANK

NTS PRECIPITATION

July 2006

	A12	BJY	CS	DRA	A06	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B	UCC
1																	
2																	
3																	
4					0.05								0.02				0.01
5	0.01					0.11		0.01									
6								0.02									
7	0.02			T					0.02								
8	0.28	0.59	0.15	T	0.03	0.20	0.04			0.24	0.32	0.12		0.03			0.17
9	0.05		0.01			0.02	0.02			0.05	0.04	0.03	0.08	0.01			
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17				0.16				0.05	0.36			0.07				0.03	
18										0.16							
19												0.02					
20			0.04		0.18		0.01			0.01		0.06		0.01		0.02	
21																	
22	0.02					0.20	0.25				0.88			0.09			
23	0.02					0.01				0.03	0.02	0.20					
24	0.33	0.15	0.23			0.87				0.10		0.02	0.25		0.05		0.04
25	0.18					0.18							0.30				
26	0.22					0.57		0.03				0.01					
27	0.20	0.01											1.12				
28		0.01											0.02				
29																	
30																	
31																	
TOTAL	1.33	0.76	0.43	0.16	0.26	2.16	0.32	0.11	0.38	0.59	1.26	0.53	1.79	0.14	0.05	0.05	0.22

Area 12 Dip Stick Rain Gage Reading: 1.50 inches of precipitation from 07/07/2006 to 08/04/2006

Data Tabulated By: 8/10/06

Data Quality Control: 8/10/06

Certified By: 8/10/06

NTS PRECIPITATION

August 2006

	A12	BJY	CS	DRA	A06	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B	UCC
1																	
2																	
3			0.08		0.02			0.06	0.02	0.04		0.02			0.01		
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
31																	
TOTAL	0.00	0.00	0.08	0.00	0.02	0.00	0.00	0.06	0.02	0.04	0.00	0.02	0.00	0.00	0.01	0.00	0.00

Area 12 Dip Stick Rain Gage Reading: 0.00 inches of precipitation from August 4th thru September 1st 2006

Data Tabulated By: [redacted] 9-7-06

Data Quality Control: [redacted] 9-7-06

Certified By: [redacted] 9/8/06

NTS PRECIPITATION

September 2006

	A12	BJY	CS	DRA	A06	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B	UCC
1																	
2																	
3				0.03													
4	0.02					0.10											
5	0.28				0.01	0.05						0.77	0.10				
6	0.02	0.16	0.13	0.02	0.18	0.20		0.20	0.16	0.16	0.29	0.55	0.19		0.14	0.25	0.16
7	0.41	0.23	0.23	0.11	0.35	0.40	0.27	0.04	0.16	0.15	0.05	0.14		0.26	0.03	0.07	0.02
8	0.01			0.02							0.01			0.01	0.01		
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
TOTAL	0.74	0.39	0.36	0.18	0.54	0.75	0.27	0.24	0.32	0.31	0.35	1.46	0.29	0.27	0.18	0.32	0.18

Area 12 Dip Stick Rain Gage Reading: 0.60 inches of precipitation from 09/01/2006 to 10/06/2006

Data Tabulated By: [redacted] 10/10/06

Data Quality Control: [redacted] 10/10/2006

Certified By: [redacted] 10/10/2006

NTS PRECIPITATION

October 2006

	A12	BJY	CS	DRA	A06	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B	UCC
1	0.04					0.05		0.05		0.02	0.04	0.01			0.02		
2	0.05	0.02	0.03	0.03	0.02	0.04	0.03	0.05	0.02	0.02	0.06	0.05	0.02		0.02	0.02	0.02
3															0.01		
4																	
5																	
6																	
7																	
8																	
9	0.02					0.03						0.02	0.02				
10	0.05							0.02				0.15					
11																	
12																	
13	0.06	0.02	0.02	0.06	0.08	0.08	0.04	0.06	0.11	0.06	0.03	0.06	0.05	0.08	0.10	0.02	
14	0.07	0.04	0.05	0.08	0.03	0.01	0.04	0.01	0.09	0.12	0.03	0.06	0.05	0.07	0.02		0.03
15								0.01									
16	0.04				0.02	0.05		0.03		0.03			0.03		0.02		0.02
17																	
18								0.02									
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
31																	
TOTAL	0.33	0.08	0.10	0.17	0.15	0.26	0.11	0.25	0.22	0.25	0.16	0.35	0.17	0.15	0.19	0.04	0.07

Area 12 Dip Stick Rain Gage Reading: 0.05 inches of precipitation from 10/05/2006 to 11/03/2006.

Data Tabulated By: [signature] 11/07/2006

Data Quality Control: [signature] 11/07/2006

Certified By: [signature] 11/9/06

NTS PRECIPITATION

November 2006

	A12	BJY	CS	DRA	A06	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B	UCC
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11	0.07					0.05						0.07					
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
TOTAL	0.07	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00

Area 12 Dip Stick Rain Gage Reading: 0.05 inches of precipitation from 11/03/2006 to 12/02/2006

Data Tabulated By: 12/05/06

Data Quality Control: 12/05/06

Certified By: 12/5/06

NTS PRECIPITATION

December 2006

	A12	BJY	CS	DRA	A06	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B	UCC
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9	0.27	0.04	0.07		0.05	0.14	0.02	0.07		0.18	0.03	0.02	0.05	0.16	0.13		0.01
10		0.06	0.14	0.01	0.02	0.17	0.08	0.04	0.01	0.18	0.07	0.13	0.29	0.03	0.07		0.22
11																	
12																	
13																	
14																	
15																	
16	0.39	0.32	0.33	0.32	0.32	0.75	0.45	0.50	0.39	0.55	0.31	0.33	0.35	0.50	0.63	0.35	0.18
17	0.37		0.21	T		0.09	0.06	0.02		0.01	0.02	0.02		0.03	0.02	0.02	0.23
18																	
19																	
20																	
21																	
22				T													
23																	
24																	
25																	
26																	
27			0.01	0.04	0.02				0.02								
28																	
29																	
30																	
31																	
TOTAL	1.03	0.42	0.76	0.37	0.41	1.15	0.61	0.63	0.42	0.92	0.43	0.50	0.69	0.72	0.85	0.37	0.64

Area 12 Dip Stick Rain Gage Reading: 0.90 inches of precipitation from 12/01/2006 to 01/03/2007

Data Tabulated By: [redacted] 01/09/07

Data Quality Control: [redacted] 01/09/07

Certified By: [redacted] 01/09/007

NTS PRECIPITATION

January 2007

	A12	BJY	CS	DRA	A06	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B	UCC
1																	
2																	
3																	
4	0.06	0.03		0.04	0.04	0.03	0.02		0.05	0.07	0.02	0.07	0.01	0.02		0.05	0.04
5																	
6																	
7																	
8																	
9																	
10																	
11	0.06					0.03	0.01		0.02	0.02		0.02					
12				T													
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27												0.02					
28																	
29																	
30																	
31																	
TOTAL	0.12	0.03	0.00	0.04	0.04	0.06	0.03	0.00	0.07	0.09	0.02	0.11	0.01	0.02	0.00	0.05	0.04

Area 12 Dip Stick Rain Gage Reading: 0.00 inches of precipitation from 01/03/2007 to 02/01/2007

Data Tabulated By: 02/05/07

Data Quality Control: 02/05/07

Certified By: 02/07/07

NTS PRECIPITATION

February 2007

	A12	BJY	CS	DRA	A06	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B	UCC
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8													0.08				
9																	
10	0.06					0.12		0.02		0.03	0.07	0.09	0.02		0.09		
11	0.04		0.02	T				0.02					0.07				
12												0.02					0.01
13	0.01		0.03	0.15	0.09				0.56	0.20	0.22	0.01			0.09	0.15	0.05
14	0.01																
15																	
16	0.01																
17																	
18						0.03					0.05	0.12	0.01		0.15		
19	0.09	0.06		T	0.02	0.01				0.11		0.08	0.04		0.02		
20																	
21																	
22	0.03					0.02		0.02			0.03	0.10			0.01		
23																	
24																	
25																	
26						0.03					0.02						
27	0.15					0.07					0.05	0.27	0.02		0.04		0.01
28				T													
TOTAL	0.40	0.06	0.05	0.15	0.11	0.28	0.00	0.06	0.56	0.34	0.44	0.69	0.24	0.00	0.40	0.15	0.07

Area 12 Dip Stick Rain Gage Reading: 0.20 inches of precipitation from 02/01/2007 to 03/01/2007

Data Tabulated By: [redacted] 3/5/07

Data Quality Control: [redacted] 03/06/07

Certified By: [redacted] 03/08/07

NTS PRECIPITATION

March 2007

	A12	BJY	CS	DRA	A06	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B	UCC
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20	0.04	0.01	0.03	0.01		0.04	0.09	0.03	0.01		0.03	0.14					
21	0.02	0.01		0.01	0.01	0.01		0.01		0.01	0.02	0.17		0.01	0.01		
22												0.02					
23																	
24																	
25																	
26	0.01																
27	0.25	0.05		T	0.01	0.29		0.13		0.04	0.20	0.11	0.11		0.11	0.01	0.04
28																	
29																	
30																	
31																	
TOTAL	0.32	0.07	0.03	0.02	0.02	0.34	0.09	0.17	0.01	0.05	0.25	0.44	0.11	0.01	0.12	0.01	0.04

Area 12 Dip Stick Rain Gage Reading: 0.30 inches of precipitation from 03/01/2007 to 04/02/2007

Data Tabulated By: [redacted] 04/03/2007

Data Quality Control: [redacted] 04/03/2007

Certified By: [redacted] 04/04/07

NTS PRECIPITATION

April 2007

	A12	BJY	CS	DRA	A06	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B	UCC
1																	
2																	
3																	
4																	
5																	
6												0.02					
7																	
8																	
9																	
10																	
11																	
12				0.02	0.01	0.01											
13																	
14						0.02											
15	0.04	0.18	0.75	0.23	0.55	0.23	0.20	0.06	0.27	0.26		0.17	0.32	0.43	0.14	0.34	0.34
16	0.22		0.02	0.11	0.04		0.02	0.01	0.07	0.01	0.10	0.02		0.04	0.01	0.05	0.04
17																	
18																	
19						0.01						0.02	0.13		0.01		
20	0.25	0.08	0.02	T	0.02	0.21	0.03	0.16	0.01	0.02	0.13	0.05			0.06		
21	0.01				0.02				0.01				0.03				
22	0.13	0.40	0.18	T	0.20	0.30	0.07	0.14	0.08	0.47	0.41	0.09	0.33	0.10	0.44	0.09	0.26
23	0.16			T				0.01	0.01	0.03	0.01	0.11			0.01	0.01	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
TOTAL	0.81	0.66	0.97	0.36	0.84	0.78	0.32	0.38	0.45	0.79	0.65	0.48	0.81	0.57	0.67	0.49	0.64

Area 12 Dip Stick Rain Gage Reading: 0.80 inches of precipitation from 04/02/2007 to 05/01/2007

Data Tabulated By: [redacted] 05/03/07

Data Quality Control: [redacted] 05/03/07

Certified By: [redacted] 5/9/07

NTS PRECIPITATION

May 2007

	A12	BJY	CS	DRA	A06	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B	UCC
1																	
2																	
3																	
4	0.04	0.01	0.01		0.02	0.06	0.01	0.01		0.01	0.01	0.02	0.04		0.02	0.02	
5	0.02		0.01	T	0.01	0.02				0.02		0.02	0.01			0.01	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22	0.02					0.01							0.01				
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
31																	
TOTAL	0.08	0.01	0.02	T	0.03	0.09	0.01	0.01	0.00	0.03	0.01	0.04	0.06	0.00	0.02	0.03	0.00

Area 12 Dip Stick Rain Gage Reading: 0.20 inches of precipitation from 05/01/2007 to 06/01/2007

Data Tabulated By: [signature] 06/07/07

Data Quality Control: [signature] 06/07/07

Certified By: [signature] 06/08/2007

NTS PRECIPITATION

June 2007

	A12	BJY	CS	DRA	A06	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B	UCC
1																	
2																	
3																	
4																	
5										0.04							
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Area 12 Dip Stick Rain Gage Reading: 0.00 inches of precipitation from June 1 to July 6,2007.

Data Tabulated By: 7/10/07

Data Quality Control: 7/10/07

Certified By: 7/11/07

APPENDIX F

SITE-SPECIFIC MONITORING DATA

*Monitoring data is summarized in Section 4.0 of this report, and the complete data set is kept in the project files in Mercury, NV.

THIS PAGE INTENTIONALLY LEFT BLANK

LIBRARY DISTRIBUTION LIST

THIS PAGE INTENTIONALLY LEFT BLANK

LIBRARY DISTRIBUTION LIST

U.S. Department of Energy National Nuclear Security Administration Nevada Site Office Technical Library P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Uncontrolled, electronic copy)
U.S. Department of Energy Office of Scientific and Technical Information P.O. Box 62 Oak Ridge, TN 37831-0062	1 (Uncontrolled, electronic copy)
Southern Nevada Public Reading Facility c/o Nuclear Testing Archive P.O. Box 98521, M/S 400 Las Vegas, NV 89193-8521	2 (Uncontrolled, electronic copies)
Manager, Northern Nevada FFACO Public Reading Facility c/o Nevada State Library & Archives Carson City, NV 89701-4285	1 (Uncontrolled, electronic copy)

THIS PAGE INTENTIONALLY LEFT BLANK